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Farm Gates: Design Considerations

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Farm gates are a necessity for controlling traffic and increasing security. There are many design considerations for optimizing a system of farm gates. Very few gates incorporate all the recommended design components that will be discussed in this publication. However, to move people, materials, equipment, and livestock through a gateway, the gateway should economize time, be navigable, and operate in an efficient manner. Time spent operating a poorly designed gateway is wasted and a hindrance to production. This publication is a guide to aid producers in creating more functional designs for gateways.

As a general rule, a producer should try to limit the number of gates on a farm to only what is necessary. Gates leading into adjacent fields should be placed as close together as possible to limit travel distances and preferably placed in a corner. Figure 1 is an illustration of a livestock alleyway that provides four different fields or options for a producer to use for moving livestock. Electric spring gates are used to facilitate rotational grazing. At the same time, the intersection provides a single watering source that can serve all four fields.

Fencing and gates also create the added benefit of a compound that allows for the capture and containment of livestock for treatment and loading (Figure 2). An enhanced gate system like the one shown in Figure 2 can also create a multi-functional system for watering livestock that includes room for concentrated diets, mineral feeders, and insecticide treatments. This system reduces the number of waterers, maintenance, and spare parts needed for an operation. It also has the ability to provide water to two groups of livestock at one time. An all-weather surface has been included

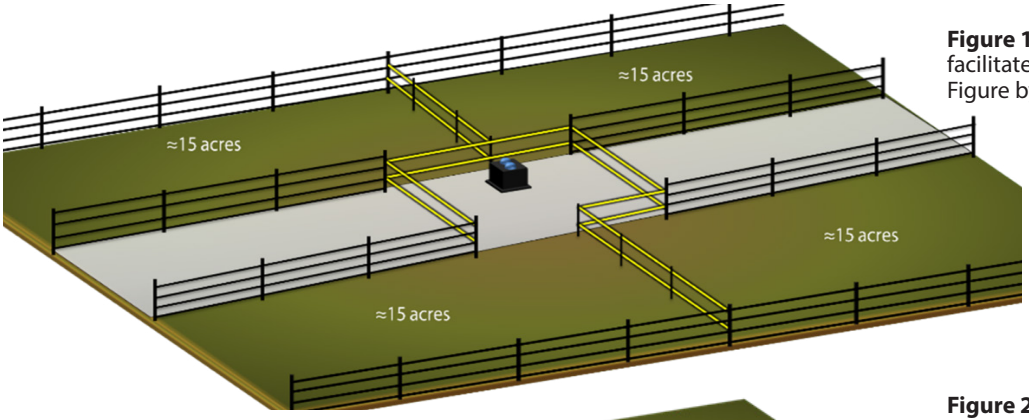

Figure 1. Efficiency of gates that facilitate rotational grazing.
Figure by Donnie Stamper

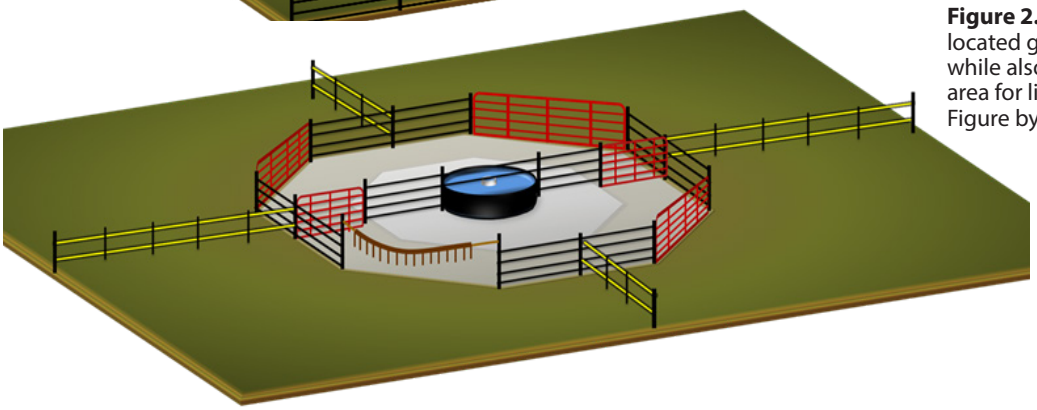

Figure 2. An example of how closely located gates facilitate rotational grazing, while also creating a temporary holding area for livestock.
Figure by Donnie Stamper

within the holding area in Figure 2 using concrete, geotextile fabric, and rock to control mud and facilitate the collection and utilization of manure.

When moving from field to field, farm roads run along the fence to gateways that have been created in the corners. This provides the ability to facilitate livestock flow by funneling them through the opening. Having the gates in corners, along the road, eliminates production issues associated with driving diagonally across fields to reach the next gate.

A major consideration when siting a gate is the width of the opening. The modern standard for a gate opening is 14 feet. However, a gateway must be able to accommodate machines and equipment that must be moved through the gate. Therefore, a larger opening may be required. Gates larger than 14 feet place excessive force on the hanging post (the post that the gate is mounted to). When a large opening is required (greater than 14 feet), many producers will opt to install two opposing, smaller gates that meet in the center of the gateway or lane.

Designing and installing effectively latching gates is another considerable challenge. Ideally, a drop-over catch should be installed to secure a pair of opposing gates (Figure 3). A drop bolt located at the center is also desirable for securing gates along the ground interface. The most common gate closure encountered on a farm is a chain with a fastener attached to the latching post (the post to which the gate swings to and is fastened to for closure). However, a self-latching gate is ideal.

The site chosen for a gate should be a summit position on the landscape, if at all possible. Drainage should not move through or across the gateway. Figure 4 shows a gate installed near the top of a draw. The drainage pipe in the road ditch discharges from the road directly across the length of the gateway. Even when a reinforced surface is installed it may fail in areas with concentrated flows or when the possibility of being submerged exists. Situations like this should be avoided at all costs to ensure the longevity and proper function of the gate and surrounding area.

An important part of a gate installation is the creation of a heavy traffic pad through the gateway and surrounding vicinity. These pads are usually constructed by excavating topsoil to a compactible sub-base, covering the sub-base with a layer of geotextile fabric, then covering the fabric with approximately 8 to 12 inches of compacted dense graded aggregate. Compaction is best accomplished by running a plate compactor or vibratory roller over the lightly wetted dense graded aggregate in 4-inch lifts. Typically, these pads will extend through the gate about 15 feet to prevent mud from being created in the gateway. The shape of the pad should extend into the field to create a radius around the gate opening. Figure 5 shows an extreme example of what livestock can do to a gateway without a reinforced surface. More details on the installation and siting procedures for heavy traffic pads can be found in Appropriate All-Weather Surfaces for Livestock (AEN-115) (http://www2.ca.uky.edu/agcomm/pubs/AEN/AEN115/AEN115.pdf).

Figure 3. This heavy-duty gate utilizes a reinforced drop-over catch mechanism that ensures closure of the gateway and provides peace of mind to the producer. Photo by Steve Higgins

Figure 4. Drainage water should not run through or across a gateway. Photo by Lee Moser

Another design element is the direction of the gate's swing. Gates can be designed to swing one way or two ways. Generally, one-way gates are mounted on either side of a hanging post, with the end of the gate coming to rest at or near the center of the same side of the latching post. Two-way gates are generally mounted in between a hanging post and a latching post and are designed to allow the gate to travel in either direction. It is good practice to include a slam or stop post in the design of a two-way gate to ensure that the gate does not sustain damage by being swung into the hanging post at extreme angles. Failure to include a slam or stop post can cause bending of gates and/or hardware and lead to poor closure and reduced strength. In some cases, the direction of the swing depends on the topography and application. It could also depend on producer preferences and their livestock management needs. Small catch pens, stockyards, and horse farms typically install gates that swing out. Deep bedded pens and yards should have gates that swing out since the litter will inhibit the movement of the gate.

Gates should not swing out toward a main road. There are some exceptions to this rule, for instance, when there is a suitable setback off the road. It is acceptable to have gates swinging out toward farm lanes. Having the gate swing to the outside of a paddock or pasture can be strategically beneficial if it opens to a lane. In this case, if it spans the entire width of the lane, the gate can be used to close off the lane at that point. There should be an additional gate installed at the entrance and exit of any livestock facility to contain escapes. A cattle guard is one option, although a gate provides more security. This practice serves as one final point of containment to ensure the safety of livestock and reduces the risk of livestock/vehicle accidents on the highway.

Materials chosen for a gateway should be as resistant to rot and insect damage as possible. Common materials used to create gates and gateways are wood, aluminum, and steel (mild or galvanized). Materials come in all shapes and sizes. Cost, availability, tradition, and personal preference are factors that will determine the materials chosen. There are producers who still fabricate wooden and steel gates that are typically used for livestock handling facilities. However, most producers purchase gates or leave the purchase and installation of gates to hired fencing contractors. The issue with purchasing gates and hinge hardware is that available materials are often limited to the products that manufacturers provide. Economy gates are available in every farm store, but they do not last very long for a variety of reasons. They make a decent temporary gate. If you want a gate that lasts 3 to 5 years, that is the gate for you. The thin gauge steel used in their construction is the primary reason for failure. They are easily damaged and rust quickly. The cheapest gates are not the cheapest gates in the long run. Spending the extra money on heavy-duty gates and hardware will save you time and money over the long run.

Figure 5. An extreme example of the damage that can occur when a heavy traffic pad is not installed in a gateway. Photo by Glenn Aiken

Another issue with modern materials is that the currently produced treated wood is more susceptible to rotting now than in the past due to changes in the treatment process. The treatment process entails applying a liquid preservative to the exterior surface of the wood. Therefore, once the skin of the wood has been penetrated by cutting, screwing, or bolting, the treatment seal has been broken. This leaves the wood more prone to rotting and deterioration. Furthermore, some grades of treated wood are not designed for ground contact. Aluminum and steel are not susceptible to rotting, but they can and do deteriorate. The speed at which materials deteriorate is controlled by the thickness, type of material, grade of metal, and post construction treatments. Characteristics of the soil and climate can also influence the rate of decomposition/corrosion of fencing and gate materials.

Figure 6. Choose gate materials known to be durable for your climate and farming needs. Purchasing inferior materials can lead to a reduced lifespan and injuries, and result in costly, premature replacements. Photo by Steve Higgins

A gateway should be resistant to heavy livestock pressure. Figure 6 shows how gate material can become compromised over time by wind and livestock pushing

against the gate. Figure 7 shows a haphazardly repaired gate that is a risk for livestock escape.

The vast majority of gates are attached to wooden posts. Driven posts are the most commonly encountered type of post. It is not recommended to drive a square wood post because it may twist, affecting the installation of the hinge hardware. When rocks are encountered, posts are often set in concrete due to the inability to drive them to a desired length. Other materials used for posts include steel, galvanized steel, concrete, stone, brick, etc. Gate posts should be a minimum of 8 feet long, with one third of the post below ground, unless set in concrete. If a wood post is used for a gateway, the preferred diameter is 8 to 10 inches. The hanging post and latching post should be vertically plumb and parallel to each other. Construction of the gateway should start with driving the hanging post, then hanging the gate, and then driving the latching post. Otherwise, the gate may not fit properly.

Once installed, the gate should move easily and stand open. However some producers prefer a self-closing gate. This feature is ideal for limiting the impact of hunters and trespassers, who tend to leave gates open. Combining this feature with a self-latching component provides a means for preventing escapes.

Most commercially available gates come with some sort of hardware for attachment to a gate post. This could be through-bolt or screw-in hangers and the accompanying hinges. One of the biggest issues with gate installations is the hardware (the hangers and hinges), which must be positioned precisely if the gate is to operate smoothly. There is typically little room for adjusting threaded thumb hinges. However, there is hardware that can be manufactured or purchased to provide adjustment. These would include through-bolt hardware, shape plates, or bolted plates, which can accommodate square or round posts.

One method of installing the hinges is to position them in line with each other with the use of a plumb bob hanging from the upper hanger. Parallel aligned hangers mounted to a true vertical post will allow the gate to come to a rest in any position (Figure 8), assuming the contour of the ground does not interrupt the swing. Manipulating the alignment of the hangers can induce the gate to swing in one direction or the other (Figure 9). This can be advantageous when you desire a self-latching gate. If correctly aligned, the gate should swing closed gently and smoothly, with a slight push, and it should have the momentum to latch itself securely. Conversely, you can adjust hanger hardware to ensure that a gate swings to stay open. Fine-tuning the swing of the gate should be done after the gate is hung.

The material used to latch the gate should allow a person to operate the mechanism with ease. There are a number of options, ranging from sliding bolts to slot latches. Many of the high-end hardware options have the ability to lock without using a chain. It can be beneficial to install bottom-of-the-gate rests to relieve the tension on the gate. These rests can be as simple as a spare screw-in hanger, which you lift and rest the bottom of a hollow, round tube gate onto.

Figure 7. The need for gate repair is inevitable. Repairs should maintain the original integrity of the gate and be able to restrict the movement of livestock. If a gate is no longer resistant to livestock pressure then it is time to replace the gate. Photo by Dan Miller

Summary

If a producer chooses to purchase a gate, a lot of the decision-making has been left to the supplier. However, high-end and custom gate manufacturers fabricate well-designed gates and hardware to the producer's desired specifications. Understanding the various gate options and choosing the right materials, sighting, and supporting practices for your situation are critical to the functional design of a gateway. Implementing supplementary best management practices in gateways such as heavy traffic pads and conducting routine maintenance will increase the function and life of the gate/gateway. One of the most important gate management practices is to treat gates and gateways with respect. After all, they provide the valuable service of protecting your livestock investment. For instance, do not open or close a gate with a vehicle. Do not climb over them. Gates are points of heavy pressure on the farm and need routine attention and maintenance to continue to operate effectively. Install stiles to increase efficiency to reduce the need for opening gates when only a human needs to pass.

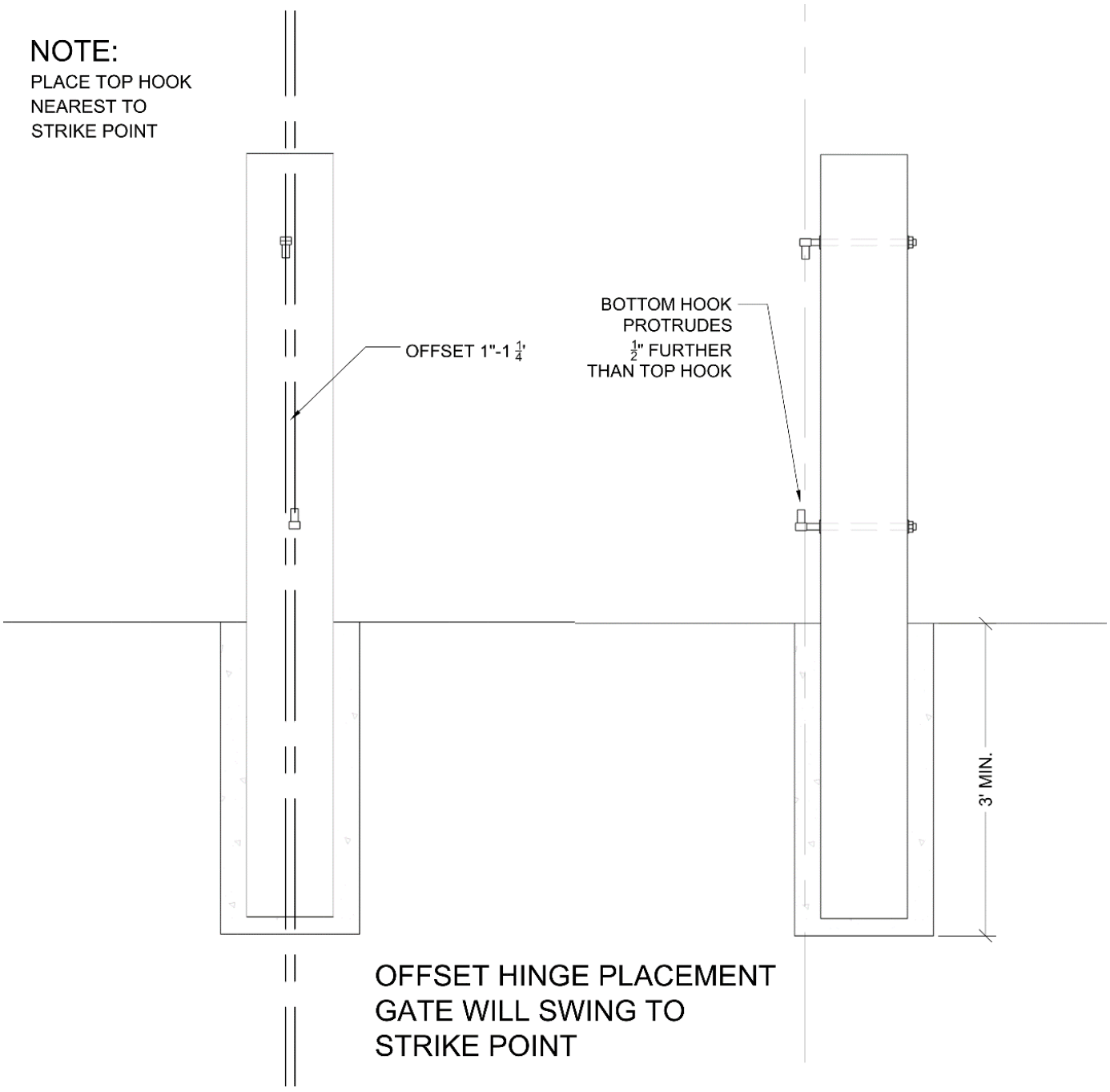

Figure 8. Inline mounting ensures that the gate stays at rest when released by operator. Figure by Jimmy Ash

Simply put, hanging a gate is a practical art. Before designing a gateway on your own operation, take any opportunity to help install a gate and gateway at another operation. When looking at gateways on other farms, observe the craftsmanship and learn from others' failures and successes.

Reference

Fixed Equipment of the Farm. Leaflet No. 8: Farm Gates, 1964, HMSO [(260 (90-3)].

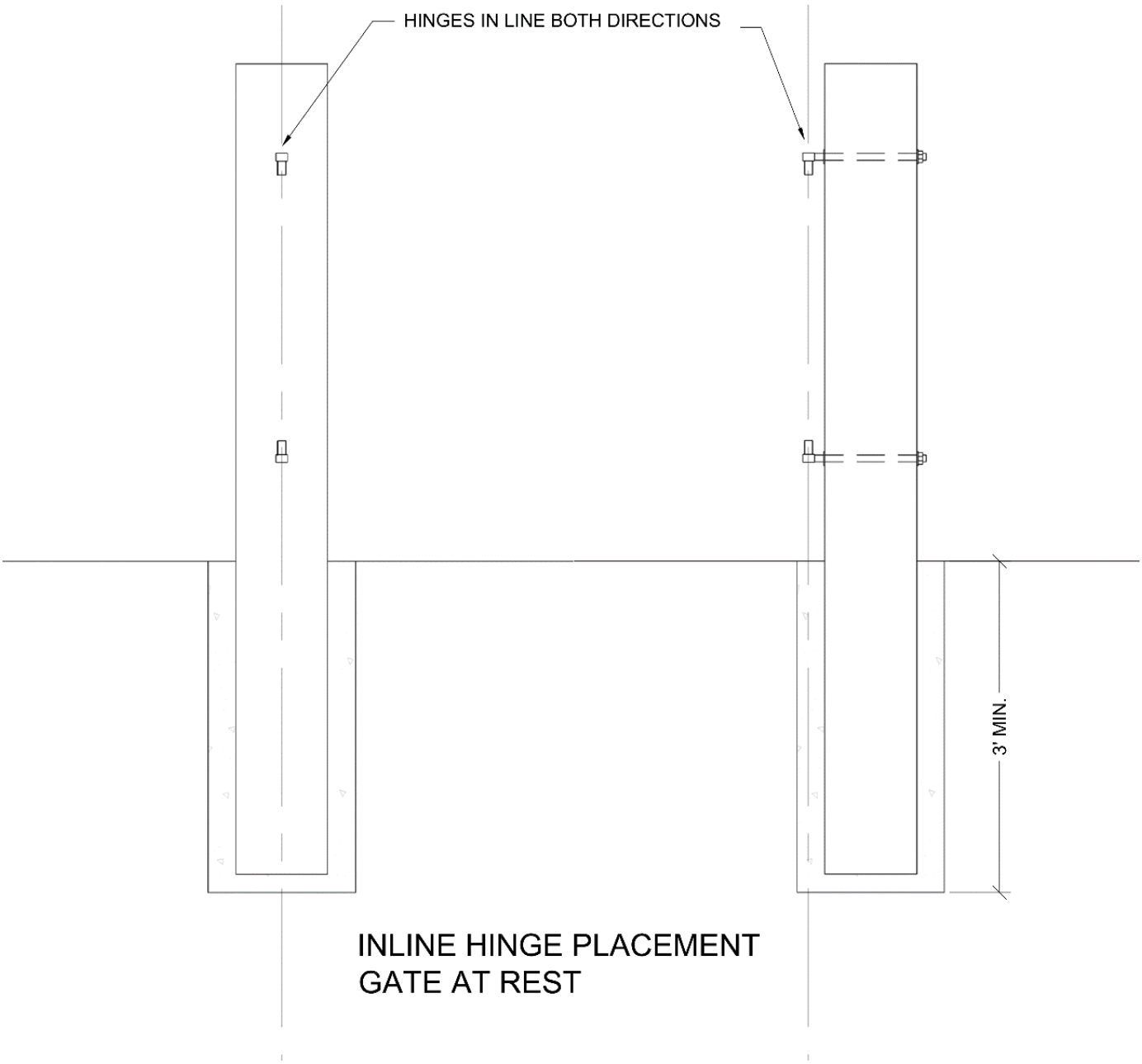

Figure 9. Offset gate hangers to ensure the gate swings in the desired direction of travel upon release by the operator.
Figure by Jimmy Ash

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