

Agricultural fencing

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In agriculture, fences are used to keep animals in or out of an area. They can be made from a wide variety of materials, depending on terrain, location and animals to be confined. Most **agricultural fencing** averages about 4 feet (1.2 m) high, and in some places, the height and construction of fences designed to hold livestock is mandated by law.

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A sturdy and well-made wooden post and rail fence

History



Timber agricultural fence (photo taken in 1938).

Historically throughout most of the world, domesticated livestock would roam freely and were fenced out of areas, such as gardens or fields of crops, where they were unwanted. Over time, especially where crop agriculture became dominant and population density of both humans and animals was significant, livestock owners were made to fence their animals in.

The earliest fences were made of available materials, usually stone or wood, and these materials are still used for some fences today. In areas where field stones are plentiful, fences have been built up over the years as the stones are removed from fields during tillage and planting of crops. The stones were placed on the field edge to get them out of the way. In time, the piles of stones grew high and wide.

In other areas, fences were constructed of timber. Log fences or split-rail fences were simple fences constructed in newly cleared areas by stacking log rails. Earth could also be used as a fence; an example was what is now called the sunken fence, or "ha-ha," a type of wall built by

digging a ditch with one steep side (which animals cannot scale) and one sloped side (where the animals roam).

Fence laws

The tradition of fencing out unwanted livestock prevails even today in some sparsely populated areas. For example, until the mid-20th century, most states in the American West were called "open range" ("fence out") states, in contrast to Eastern and Midwestern states which long had "fence in" laws where livestock must be confined by their owners. Though the open range was part of the western tradition, over time, open range was limited long before it was eliminated completely; first came an obligation to keep cattle from roaming onto state and federal highways, where collisions with fast-moving cars and trucks created a public safety hazard. In addition, voters could voluntarily choose to make certain heavily farmed areas a "herd district," where livestock needed to be fenced in, a process that also became popular in areas where development of hobby farms created conflicts between large and small landowners. Over time, court cases steadily limited the application of open range law until the present day, where it is the exception rather than the rule in many parts of the American West.

In the United Kingdom, the law is different for private land and common land. On private land it is the owner's responsibility to fence livestock in, but it is the responsibility of landowners bordering a common to fence the common's livestock out.

Modern styles

Wire fences

The principle of wire fences is that they are supported mainly by tension, being stretched between heavy strutted or guy-wired posts at ends, corners, and ideally at intervals in longer stretches (every 50 to 300 metres, 150 to 1000 feet). Between these braced posts are additional smaller wooden or metal posts which keep the wires spaced and upright, usually 3 to 6 metre (10 to 20 feet) apart, depending on the style of fencing used.

Traditionally, wire fencing material is made of galvanized mild steel, but galvanized high-tensile steel is now also used in many places. To prevent sagging of the fence, which raises the risk of entanglement or escape, the wire is tensioned as much as the material will safely allow during construction by various means, including a hand-operated "wire stretcher" or "fence stretcher"^[1] (called a "monkey strainer" in some areas) or other leverage devices, a winch, or even by carefully pulling with a tractor or other vehicle.

Wire fences are typically run on wooden posts, either from trees commercially grown in plantations or (particularly in the American West) cut from public lands. When less expensive or more readily available than wood, steel T-posts or star posts are used, usually alternating every 2 to 5 steel posts with a more stable wood post. Non-electrified wire is attached to wooden posts using fencing staples (for intermediate posts, these are fitted loosely, not gripping the wire). Non-electrified wire is held on T-posts by means of wire "clips" made of smooth galvanized wire that wrap around the back of the post and hook onto the wire on either side of the post.^[2]

Other than in a truly desert climate, use of rot-resistant wooden posts or steel posts is advised. In the United States, wood with natural rot resistance, such as oak and juniper, was often used until it became in short supply in the 1950s. Then, chemically treated pine and spruce posts became prevalent, and these are also widely used in Britain, together with chestnut. Creosote, pentachlorophenol, and chromated copper arsenate are all widely used in the US and elsewhere for treatment (although some of these chemicals are subject to legal controls).

Barbed wire

The Industrial Revolution brought the first barbed wire (also "barbwire" or just "barb") fences, which were widely used after their introduction in the mid-19th century. This technology made it economically feasible to fence rangeland for the first time. In the United States, introduction of barbed wire contributed to the range wars of that century, as various ranch interests attempted to use barbed wire fences to claim exclusive access to the best pasture and water resources, including those lands in the public domain. It also exacerbated tensions between cattle ranchers and crop farmers, partly when access to water was involved.

Barbed wire has been made by many manufacturers in an almost endless variety of styles. For the most part these were functionally identical. The differences reflected peculiarities of each manufacturing process rather than deliberate design of the end product. Sections of unusual barbed wire are collected by some enthusiasts.

The traditional barbed wire used since the late 19th century and into the present day was made from two mild steel wires twisted together, usually of about 12 or 14 gauge, with about 15–30 twists per metre. Steel barbs were attached every 10–20 cm. Barbs had either two or four points, with the two point design using somewhat heavier and longer barbs. The relative merits of two point vs. four point barbed wire are the subject of deeply held views among many farmers and ranchers, to the extent that both types are still made today.

Typically four strands of barbed wire, with the lowest strand no more than 12 inches (300 mm) from the ground and the top strand at least 48 inches above the ground, make up a legal fence in the western United States. Better-quality fences have five strands, older fences often had only three strands, and just two strands is widely used in Britain if only adult cattle are being contained. Other variations exist, depending on local laws and the purpose of the fence.

Barbed wire is particularly effective for containing cattle. In pastures containing both cattle and sheep, one or two strands of barbed wire is used in conjunction with woven wire to both discourage cattle from reaching over the top of a fence and to keep sheep from crawling under. Though often used in many areas for horses, barbed wire is not advised; its use is considered poor management. There is very high risk of injury occurring when a thin-skinned, fast-moving animal with long legs runs into it or puts a leg through the strands.

Smooth wire

Smooth (or plain) wire is essentially the same product as barbed wire with no barbs – either a two-wire twist or a single strand. Its primary advantage is that it is less likely to cause lacerations and cuts if an animal becomes entangled in it or rubs against it. However, animals will readily lean on mild steel smooth wire, stretching it out of shape or loosening it from the posts, and for this reason it is often used in high-



Chain link fence with barbed wire on top.



Detail of barbed wire

tensile form, which more easily springs back to its original length. Smooth wire fencing is often used as an inexpensive material to safely contain horses and other animals that run a high risk of entanglement, usually in conjunction with a line of electric fence. Smooth wire is also used in securing fence-post braces and other uses where barbed wire is not recommended

High tensile wire

High tensile (H-T or HT) fencing is a special hard, springy steel wire (<http://www.premier1supplies.com/img/instruction/153.pdf>) that was introduced in the 1970s and has slowly gained acceptance. The wire may be a single strand plain or barbed wire, or woven mesh, and is capable of much higher tension than mild steel. It permits the use of wider post spacings^[3] and is neither stretched easily by animals, nor by fallen trees or branches. It can be insulated and electrified. Because of the wide spacing of the posts, thin metal or wood spacers (or "droppers") may be attached to the wires between posts to maintain their spacing.

Joining HT wire is difficult because of its stiffness and its reduction in strength when bent sharply. However, it may be joined effectively with proprietary clips. HT wire is more expensive than mild steel, but because of the need for fewer posts, the overall cost of the fencing is usually comparable.

Because it does not stretch, animals are less likely to become entangled in HT wire. However, for the same reason, if an animal does become entangled or runs into a few strands at a high speed, it can be deadly, and is sometimes referred to as having a "cheese slicer" effect on the animal.

Trellising for horticultural purposes is generally constructed from HT wire as it is able to withstand a higher crop load without breaking or stretching.

Woven wire

Barbed wire cannot effectively contain pigs, goats or sheep. Where these animals are to be fenced, woven wire (called sheep or pig netting in Britain, sheep fence or hog fence in the United States) is used instead, often with one or more strands of barbed wire at the top. For swine, a ground-level barbed wire strand or electrified wire is used as well to prevent them digging beneath the fence.

Agricultural woven wire is identifiable by wire "knots" wrapped around each intersecting wire. Cheaper forms of wire used in residential fences are often spot welded at junctions and as such are less sturdy and may break, creating a hazard for enclosed animals. Woven wire is more costly to purchase and time-consuming to install than is basic wire, but is often safer and less expensive than wood, pipe, or other materials.

Woven wire with large openings (known as "sheep fence" in the western United States and *Ringlock* in Australia) has some potential hazards. Animals contained inside the fence can easily put a foot through the wide squares while grazing along the edge of the fenceline or while reaching over it, and then become tangled in the fence. It is also dangerous for wild animals, such as deer, kangaroos or wallabies that attempt to jump such fences. These can become trapped when their back feet clip the fencing and get caught. While they can be cut out, they are often seriously injured and must be euthanized. A variation, called "field fence," has narrower openings at the bottom and wider openings at the top, which prevents animals from getting their feet entangled while grazing close to the fence, though is of little help if an animal becomes tangled in the openings higher up.

Horses and ponies in particular are safer kept inside woven wire fence with squares of smaller dimensions, such as "no climb" fence with squares that are approximately two inches by four inches. This type of wire is also more effective for containing goats.

Another variant on woven wire is the "hog panel," which consists of heavy welded wire approximately .25 inches (6 mm) or more in diameter. It resembles field fence in appearance, but is sold in panels rather than rolls and is not easily wrapped or bent. However, larger livestock such as horses or cattle can easily deform hog panels, so if used to contain large animals, it requires supporting rails or pipe on both the top and sides. It has some of the same strengths and weaknesses as field fence. Though animals are less likely to become entangled in it, the wire is far harder to cut if they do.

Chain link fencing is, arguably a form of woven wire, and is occasionally used for some livestock containment. However, due to cost, it is not particularly common for fencing large areas where less-expensive forms of woven wire are equally suitable. When used in small enclosures, it is easily deformed by livestock, resulting in high ongoing maintenance costs.



Smooth (or plain) wire is less likely to cause lacerations than barbed wire



A kangaroo trapped in ringlock or "sheep" fencing.



A closely spaced woven wire such as this "no climb" fence has a lower risk of animals becoming entrapped and injured. Note "knots" at each junction securing the wire together

Deer fence

Deer and many goats can easily jump an ordinary agricultural fence, and so special fencing is needed for farming goats or deer, or to keep wild deer out of farmland and gardens. Deer fence is often made of lightweight woven wire netting nearly 2 metres (about six feet) high on lightweight posts, otherwise made like an ordinary woven wire fence.

In areas where such a tall fence is unsuitable (for example, on mountains subject to very high winds), deer may be excluded (or contained) by a fence of ordinary height (about 1.5 metres, four feet), with a smaller one of about one metre (three feet) high, about one metre away from it, on the same side as the deer. The additional width prevents deer approaching the fence close enough to jump it.

Electric fence



Detail of electric cord fence with metal interwoven with nylon cord, attached to a steel fence post with a plastic insulator

Electric fencing became widely available in the 1950s and has been widely used both for temporary fences and as a means to improve the security of fences made of other materials. It is most commonly made using lightweight steel wire (usually 14-17 gauge) attached to posts with insulators made of porcelain or plastic. Synthetic web or rope with thin steel wires interwoven to carry the electrical charge has become popular in recent years, particularly where additional visibility is desired.

A fence charger places an electrical pulse from ground to the wire about once per second. The pulse is narrow and usually around 5-20 kV. Animals receive an uncomfortable but harmless shock when contacting the wire, and learn to stay away from it.

Synthetic fence

Synthetic fences encompass a wide range of products. Vinyl-coated wire fence is usually based on high-tensile wire with a vinyl coating. Some forms are non-electric, others embed layers of graphite to carry a current from the wire to the outside of the coated product so that it can be electrified. It can be of any color, with white particularly common in the United States so that the fencing is visible to livestock. Most forms can be installed on either wood posts or steel t-posts.

A variant, sometimes called "vinyl rail" or "strap fencing" consists of two or more vinyl-encased wires with vinyl or other synthetic between them to create a "rail" that is anywhere from 1 to 10 centimetres (0 to 4 in) wide. Some forms may be electrified by use of a special coating on the top wire of the "rail."

Vinyl fence is installed in a manner similar to plain high-tensile fence and must be stretched tight. Strong bracing of posts at corners and in the middle of long fencelines is required. Like other wire fences, keeping vinyl fencing tightened on a regular basis is key to safety and appearance.

A mesh form of vinyl fencing without internal wires is marketed as "deer fence" and used in some locations to augment other fencing to keep out wild animals. There are also some forms of vinyl fencing that look similar to vinyl-coated wire, but do not contain an internal wire, that are marketed to livestock owners. They are marketed as particularly safe, but their strength in containing animals is under debate. These products are very new to the market.

Wood, pipe and other materials

Fences of wood, stranded cable, and pipe are used where cost is less of a consideration, particularly on horse farms, or in pens or corrals where livestock are likely to challenge the fence. Synthetic materials with wood-like qualities are also used, though they are the most expensive option in most situations. In some areas, these types of fencing materials can be cost-effective if plentiful. For example, scrap pipe is often easily obtained at a low price if oil fields are nearby, and wooden rails can sometimes be harvested from the owner's own land if it contains suitable standing timber.

Fladry lines, made of cloth, metal and/or other materials, are sometimes used on fences to discourage predators from entering a livestock enclosure. (also see: Cattle grid)

Maintenance



In addition to single strand wire, electric fencing is also made of synthetic materials with fine wire interwoven throughout the fence strands



Horse behind vinyl fence consisting of two vinyl 3-wire "rails" and one vinyl-covered wire



A pipe fence is very strong and will not break

All types of agricultural fencing require regular maintenance to ensure their effectiveness. Cattle and horses are strong enough to go through most types of fence by main force, and occasionally do so when frightened or motivated by hunger, thirst, or sex drive. Weather, flood, fire, and damage from vandals or motor vehicle accidents can do similar damage and may allow livestock to escape.

See also

- Invisible fence
- Temporary fencing
- Dingo Fence
- Electric fence
- Fence
- Rabbit-proof fence
- Split-rail fence
- Hampshire gate
- Fladry line
- Vinyl fence
- Cattle grid

References

1. "Handy Wire-Pulling Tool Has Many Uses" *Popular Mechanics*, December 1934 (https://books.google.com/books?id=yt8DAAAAMBAAJ&pg=PA897&dq=Popular+Science+1935+plane+%22Popular+Mechanics%22&hl=en&ei=gdhATrWrH8qhsQLUgbXcCQ&sa=X&oi=book_result&ct=result&resnum=5&ved=0CD0Q6AEwBDgU#v=onepage&q=Popular%20Science%201935%20plane%20%22Popular%20Mechanics%22&f=true)
2. Steel posts and accessories (http://www.kencove.com/oa/pdf/P22_23.pdf)
3. <http://efotg.sc.gov.usda.gov/references/public/NM/382spec.pdf>

External links

- Fence Planning for Horses (<http://pubs.cas.psu.edu/freepubs/pdfs/ub037.pdf>)

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