

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

FENCE

(Feet)

CODE 382

DEFINITION

A constructed barrier to livestock, wildlife or people.

PURPOSE

This practice may be applied as part of a resource management system to:

- Facilitate the application of conservation practices that treat the soil, water, air, plant, animal, and human resource concerns.

CONDITIONS WHERE THIS PRACTICE APPLIES

This practice may be applied on any area where livestock and/or wildlife control is needed, or where access to people is to be regulated. Fences are not needed where natural barriers will serve the purpose.

CRITERIA

Fencing materials shall be of a high quality and durability, and the construction performed to meet the intended management objectives. All fencing materials will be new, unless an exception is noted, with a minimum life expectancy of 10 years. The materials used in construction must be in accordance with, and equal or exceed, in strength and durability, the specifications listed in the General Specification for a fence type.

Fences shall be positioned to facilitate management requirements.

Fences shall consist of acceptable fencing designs to control the animal(s) or people of concern and meet the intended life of the practice

as described in the Fence-General Specification.

Height, number, and spacing of wires will be installed to facilitate control and management of the animal(s) and people of concern as described in the Fence-General Specification.

Materials, including type of wire, stays, size and type of posts, fasteners, and all items will be used that best provides the needs for the style of fence required as described in the Fence-General Specification for each type of fence.

Construction methods, including height, size, spacing and type of posts will be used that best provides the needs for the style of fence required and is best suited for the topography of the landscape as described in the Fence-General Specification for each type of fence.

Type and size of livestock must be evaluated when choosing the appropriate type and design of fence.

Safety guidelines for each type of fence must be strictly adhered to particularly if the fence is to be constructed to restrict human access.

CONSIDERATIONS

Consider installing fences in locations that will facilitate maintenance avoiding irregular terrain and/or water crossings.

Consider wildlife movement needs when locating fences.

Consider livestock management, handling, watering and feeding when locating fences.

Boundary fences shall comply with state laws and

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

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standards for construction.

Where applicable, clear right-of-ways will be established that will facilitate fence construction and maintenance.

Consider soil erosion potential when planning and constructing a fence on steep slopes.

Fences can frequently be arranged to provide for one livestock water facility to serve two or more fields.

Easily repaired fences such as high tensile should be used in areas where flooding may occur or where debris may collect.

Manufacturer's guidelines should be followed closely during installation of each type of fence to assure that all components are assembled properly.

Fences constructed in fragile soils and uneven landscapes may require additional bracing.

Consider how a planned fence on wildlife may harm wildlife.

Consider how a planned fence may limit equipment access.

Consider the effects of a planned fence on weed populations.

Consider how a fence will affect adjoining neighbors.

The fence industry is constantly producing new and improved materials recommended for use in constructing high tensile fence. The Natural Resources Conservation Service recommends the use of new technology as long as the materials are installed in strict accordance with the manufacturer's recommendations for the purpose intended.

PLANS AND SPECIFICATIONS

Plans and specifications are to be prepared for specific field sites based on the NRCS-WA Fence Standard, General Specifications, and appropriate state or local statutes or laws.

OPERATION AND MAINTENANCE

Regular inspection of fences should be part of an on-going management program. Inspection of fences after storm events is needed to facilitate the function of the intended use of the fence.

Maintenance and repairs will be performed as needed to facilitate the intended operation of the installed fence.

Fence repairs should be made with materials that equal or exceed the quality of the original materials.

Electric fences need to be inspected periodically to remove grasses and tree limbs that are touching the wires.

REFERENCES

Structures and Environment Handbook, MWPS-1, Midwest Plan Service, Eleventh Edition, 1983 revised 1987

Specifications for Structural Range Improvements, PNG-GTR-250, H. Reed Sanderson, Thomas M. Quigley, Emery E. Swan, and Louis R. Spink, September 1990

Fences, USDI Bureau of Land Management and USDA Forest Service, July 1988

Planning Fences, American Association for Vocational Instructional Materials, Third Printing, 1997

Building Fences, American Association for Vocational Instructional Materials, 1974

Beef Housing and Equipment Handbook, MWPS-6, Midwest Plan Service, Fourth Edition, 1987

NATURAL RESOURCES CONSERVATION SERVICE
GENERAL SPECIFICATION STANDARD POST AND WIRE

FENCE

(Feet)

CODE 382

GENERAL REQUIREMENTS

SCOPE

The work shall consist of furnishing materials and installing materials for the specified design at the location(s) shown on the plan map, drawings, or as staked in the field.

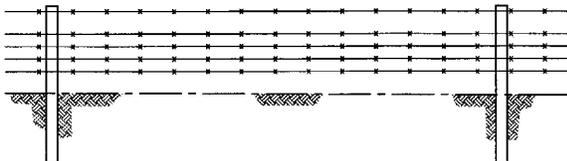
Fencing includes brace assemblies, gates, cattle guards, and other components required for meeting site conditions and achieving the objectives of the practice application.

TYPE OF FENCES

Standard Post and Wire Fence

Standard, or conventional, post-and-wire fences are suitable as permanent fence in areas that receive moderate to heavy pressure by livestock.

Barbed wire is the most common fence built. Barbed wire can endanger horses and llamas. Llamas have large, protruding eyes than can be injured by sharp points. A startled horse can run into a fence and be injured by sharp points.



High-tensile Wire Fence (non-electrified)

High tensile post-and-wire are suitable as permanent fence in areas that receive moderate to heavy pressure by livestock.

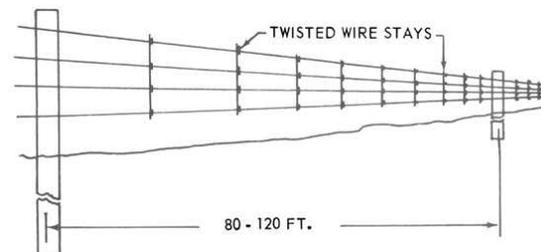
The smooth single-strand wire is the unique difference in this fencing design. These fences are typically more durable than conventional barbed wire fences and have lower maintenance costs.

Smooth wire is safer for domestic animals and wildlife than barbed wire. Smooth wire requires more wires than barbed wire to maintain an equivalent level of animal control.

Suspension Fence

Suspension fences are suitable as either interior cross fences or boundary fences. Suspension fences work well on level terrain but are not adapted to rough uneven terrain or areas of deep snow pack.

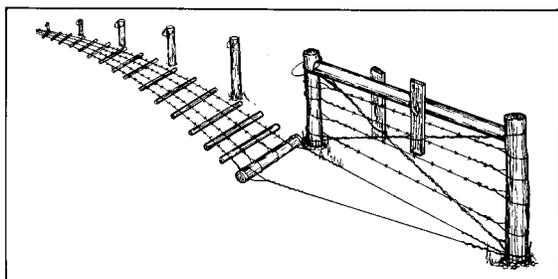
Suspension fences will last as long as conventional wire fences and require less upkeep. In areas where wind-borne weeds are a problem, a suspension fence gives less trouble than a conventional fence design, as weeds tend to work under or over the flexible wire.



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Let-down Fence

The let-down fence is basically a four-strand barbed-wire fence that can be laid on the ground during winter after the grazing season or during periods of expected big game movement, but remains under tension at all other times. This fence design offers unhindered movement to big game and is suited for use where seasonal movements of big game must be accommodated. Let-down fences are designed for mountainous areas with heavy snow pack that can loosen or break fence wires and pull over fence posts.



Although let-down fences greatly reduce fence damage due to snow or wildlife, several disadvantages of this fence design shall be noted:

- cannot protect against stray or trespass livestock when fence is down;
- must be raised and lowered each year; and
- Over winter contact with the ground corrodes fence wire more quickly.

STANDARD POST AND WIRE FENCE: Materials and Construction Specifications

Standard Post and Wire Fence Materials

The materials used in construction must be in accordance with, and equal or exceed, in strength and durability, the requirements listed in the General Specification tables for this type fence.

Wood Line Posts

Wooden posts are preferred for use in high snowfall areas because of their extra strength.

Steel Line Posts

Steel line posts can be used in moderate to low snowfall areas, or in rocky areas where posts must be pounded or drilled to be set. Steel line posts will ground a fence as long as the soil is moist. In areas where lightning is a hazard, spacing steel line posts every 150 feet in a line of wood posts offers fair protection. NOTE: This does not provide sufficient grounding or lightning protection for a high-tensile electric fence.

Stays

Table 1 Stay Requirements

Stay Type	Minimum Diameter/ Weight	Minimum Length
Wood stays are the only approved stays in deep snow areas		
Wood-sound, straight, durable	1-1/2 inch diameter 2-1/2 inch diameter in deep snow areas	Fence height + 3 inches
Wire	9-1/2 gauge twisted manufactured for this purpose Galvanized zinc coated	2 inches + distance between bottom & top wire
Fiberglass	Especially fabricated for this purpose	Fence height + 3 inches

Brace and Anchor Post

Posts must be of sufficient length to meet fence height, setting depth requirements, plus 3 inches.

Standard Post & Wire Fences Construction Specifications

Setting posts

Wood posts shall be set in holes and backfilled with compacted earth, poured concrete, or wood posts shall be driven.

Where postholes are dug, the holes shall be at least six (6) inches larger than the diameter of side dimensions of the posts. Earth backfill around posts shall be thoroughly tamped in layers not thicker than 4 inches and shall completely fill the posthole to the ground surface. Concrete backfill around posts shall be rodded into place in layers not thicker than twelve (12) inches and shall completely fill the posthole to ground surface. Backfill, either earth or concrete shall be crowned up around posts at the ground surface.

Concrete shall be class 3000 in accordance with Washington NRCS Construction Specification CS-42, Concrete for Minor Structures. Concrete shall be allowed to set for ten days before tension is applied to the brace assembly through tightening of wire.

POST DEPTH

All posts shall be placed to the required depth and shall be firmly embedded so that there is less than 1 inch of horizontal movement at the top of post when a horizontal force of 80 lb. is applied.

The deeper a post is set, the stronger the fence. Posts shall be set to the minimum depths listed in Table 7 Line Post Requirements for Standard Post and Wire Fence or Table 8 Brace Post Requirements for Standard Post and Wire Fence.

Steel line posts shall be driven solidly into the ground. Under moderate snow pack conditions, steel posts can be prevented from settling into the ground by attaching a wooden stay to each steel post.

If soil conditions prevent firmly setting line posts in the ground: rock-jacks, Figure-4's, or wire cribs may be used. If soil conditions prevent the

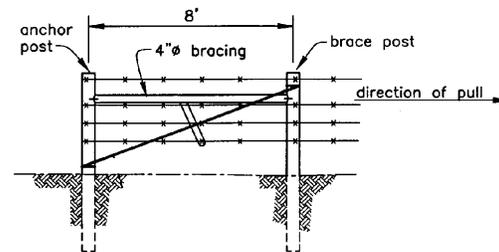
proper setting of anchor posts and brace posts in the ground; rock-jacks or rock cribs may be used. (Refer to Standard Drawings LSK-0253 and LSK-0260)

CORNER, BRACE AND GATEPOSTS

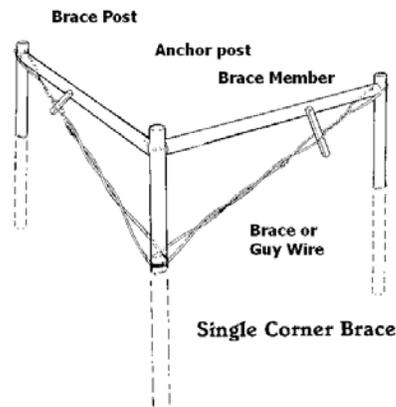
Bracing is the key determinant to the structural soundness and longevity of wire fences. Braces are required at all corners, gates, and at all definite slope breaks and changes in alignment to the line fence. Fence shall be reasonably straight and shall not deviate more than 12 inches between any corner, gate, or in-line brace assembly.

Brace Assembly Types and Nomenclature

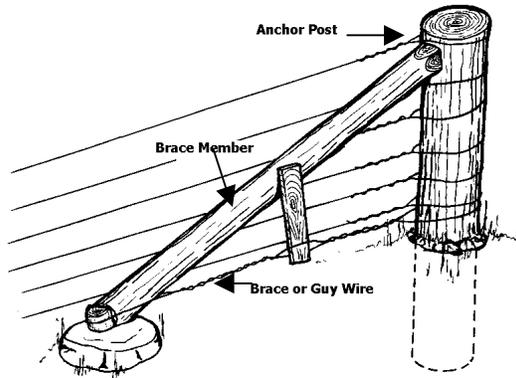
Standard H-brace



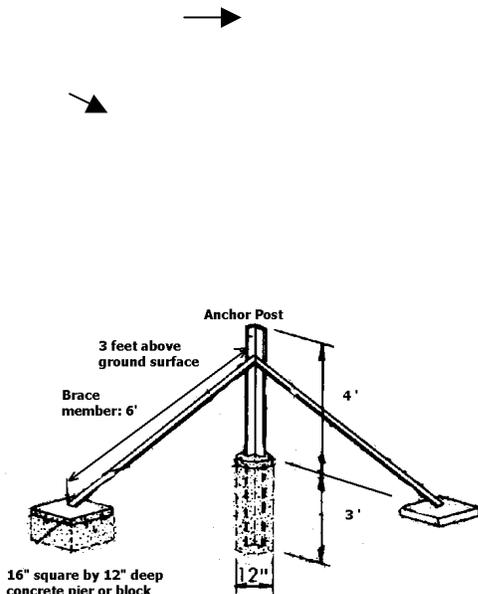
1—SPAN END



Diagonal Brace



Metal Brace



In straight sections on moderate terrain, in-line brace units are required at intervals not to exceed:

Table 2 Maximum Brace Intervals

FENCE TYPE	DISTANCE (feet)
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Standard Barbed	1320 feet
Smooth Wire Fence	4000 feet
Suspension Fence	1320 feet
Let-Down Fence	1320 feet

All line wires shall be dead-ended on the anchor post (pull post) of gate, double-panel line braces, and corner brace assemblies. On single panel line brace assemblies; each line wire segment will be dead-ended on the appropriate pull post of the assembly. Wire ends are double wrapped around the anchor posts (pull posts), stapled, and twisted back on the stretched line wire with at least six tight wraps.

Wooden horizontal brace members (compression braces) shall be at least 8 feet in length and notched into the top half of the brace post and anchor post, at 36 inches above ground level and below the top six inches of the brace and anchor post. Steel dowels can be used, rather than notching, to attach horizontal brace between anchor post and brace post

The top end of wooden diagonal brace members shall be notched into the post being braced (anchor post or pull post) approximately 36 inches above ground level

BRACE WIRE

Brace wires (or guy wires) shall be formed from two complete loops of:

- No. 9 gauge smooth wire,
- No. 12-1/2 gauge double-strand barbed or smooth wire, or
- No. 12-1/2 gauge high tensile smooth wire.

Horizontal Braces-Brace wires shall extend from a point approximately six inches below the top of the brace post to about 4 inches above the ground level of the anchor post. The brace wires shall be double-wrapped around each post, stapled and spliced together. Refer to Standard Drawing LSK-0250-Wire Fence Braces.

Diagonal Braces-Brace wires shall extend from a point approximately 4 inches above the ground level of the anchor post. The brace wires shall

be double-wrapped around anchor post and the brace member post, stapled and spliced together.

A stout stick, pipe, or metal rod, about 18 to 24 inches long, is placed mid-way along the brace wires, and all four wires are twisted together so the brace member is tightly secured and provide needed rigidity provided. Tensioners may be used in lieu of the tightening stick

Line Post Spacing

Spacing is the same for all line post materials (metal, wood, etc.)

Table 3 Line Post & Stay Spacing

FENCE TYPE	LINE POST SPACING Maximum Interval
3-Wire Fence	16-1/2 feet (1 rod)
4-Wire Fence	20-foot without stays 25-foot when one stay is set mid-way between line posts 30-foot when two stays are set at 10-foot intervals between posts
3-Wire or 4-wire suspension Fence	80 to 100 feet (not to exceed 100 feet). Stays shall be spaced not to exceed 16 feet in the line
Heavy Snow Country & Let-Down Fences	16-1/2 foot (1 rod) between wooden posts

FENCE HEIGHT and WIRE SPACING

Fence height is measured from the ground at post locations.

Table 4 Fence Height and Wire Spacing

Intended Use	Fence Height and Line Wire Spacing
domestic livestock control	36 inches minimum 45 inch maximum
Wildlife Movement Areas- In areas where big game animals are expected to cross	maximum height of 42 inches and wire spacing of the top two line wires shall be a minimum of 10

Intended Use	Fence Height and Line Wire Spacing
the fence line	inches apart at the post location
riparian pastures and riparian exclosures,	Effective height to the top line wire will not be more than 42 inches. The top wire on shall be smooth (not barbed) because riparian areas provide wildlife habitat and water
very high or very tight fences, such as small farm fences	wildlife passage must be addressed in the specifications provided to the landowner.

Deer normally jump with their hind legs forward and the distance between the two top wires is critical to adult deer. If the top two fence wires are loose or too close together, deer can entangle their hind legs and entanglement can often be fatal. Elk drag their hind legs over the top of barriers as they jump them and break the top wire.

SPLICING

When splicing of wire is necessary:

- Conventional wire- "Western Union" splice or compression fittings. Refer to Standard Drawing LSK-0001.

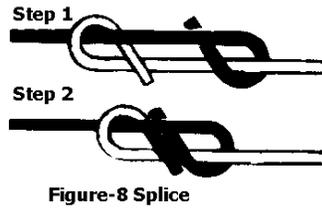


- Compression fittings.(conventional wire and high-tensile wire). To crimp wires together, overlap ends of each wire about two inches then place at least two (2) compression fitting over both wires and firmly crimp the fitting, or



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- High-tensile wire-"Figure-8".



STAPLES AND FASTENER REQUIREMENTS

Staples shall be driven into the post at an angle in the same direction as the line wire is pulling. If the line wire pull is down, staple legs shall angle downwards when driven into the post. Staples shall be driven just deep enough to snug the line wire without bending it. The line wire shall be loose in the staple. Refer to Standard Drawing LSK-0001.

Table 5 Staples and Fastener Requirements

U-shaped staple conventional wire-No. 9 gauge galvanized wire or bright hard wire; at least 1-3/4 inches long
L-shaped deformed shank staple-No. 9 gauge galvanized wire or bright hard wire; at least 1-1/2 inches long
Fence wire shall be fastened to steel posts using only steel clips manufactured for the purpose of attaching wires.
Other post types will use fasteners and methods recommended by the manufacturer.

FENCE WIRE TENSION

Temperature variations must be considered when setting the tension on line wires (wire will

tighten in cold weather and expand in hot weather). All line wires shall be dead-ended on gate, corner, or the anchor posts (pull posts) of in-line brace units.

CROSSING DRAWS OR STREAMS

Use an anchor when the bottom line wire is more than 20 inches above the ground at the low spot when crossing landscape depressions (draws or swales). All fence strands shall be anchored with No. 9 gauge, galvanized, smooth wire (or equivalent) to a weight or deadman equivalent to a 12-inch x 12-inch concrete block.

When crossing live streams or very deep draws, the fence shall be dead-ended on each side of the crossing by use of line braces. The section across the stream may be removable, a breakaway type, or swinging picket type fence.

OTHER FENCE COMPONENTS

Gates, rock cribs, fence stiles, wildlife fencing, and other fence component materials will follow the requirements of this General Specification

INSTALLATION

Installation of the fence shall conform to the specifications and Exhibits or other drawings, as provided.

The completed job shall be workmanlike and present a good appearance. The installer and other persons will conduct all work in accordance with proper safety procedures.

Table 6 Wire Type Requirements for Standard Post and Wire Fence

Wire Type	Minimum Wire Size	Minimum Protective Coating	Strand-breaking strength
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Standard Double Strand Barbed wire	12 1/2 gauge with 14 gauge or heavier two-point barbs spaced not more than 5 inches apart.	Class I galvanized per ASTM-121	950 foot-pounds or 70,000 psi
Standard Smooth double strand wire	12 1/2 gauge	Class I galvanized per ASTM-121	950 foot-pounds or 70,000 psi
Standard Smooth single strand	9 gauge	Class I galvanized per ASTM-121	950 foot-pounds or 70,000 psi
High-Tensile Double Strand Barbed Wire (Gaucho wire)	15-1/2 gauge	Class III galvanized per ASTM-121	135,000 psi
High Tensile Smooth single strand	12-1/2 gauge	Class III galvanized per ASTM-121	135,000 psi

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Table 7 Line Post Requirements for Standard Post and Wire Fence

Line Post Type	Minimum Diameter/ Weight	Minimum Setting Depths	Minimum Length	Minimum Protective Coating Other
<p>Posts do not need to be new materials; however, all posts shall meet the minimum quality criteria for durability and protective coating. Wood posts need to be sound and free from decay, with all limbs trimmed substantially flush with the body, and meet the minimum diameter requirements at a point 2 inches above the top wire. Posts shall be of sufficient length to meet setting depth, fence height requirements, plus 2 inches.</p>				
Wood-juniper, cedar, black locust	3 inches	24 inches	6 feet	
Wood-pine or similar woods	3 inches	24 inches	6 feet	Complete penetration of the sapwood with ammonical-copper-arsenate, chromated-copper-arsenate mixture or other approved treatment materials that extend a minimum of 30 inches up the post from the butt.
Standard "T" or "U" section steel Rolled from high carbon steel and studded, embossed, or punched for wire attachment with anchor plate	1.25 pounds per foot of length, exclusive of anchor plates	18 inches	5 1/2	Hot dip galvanized, or One or more coats of high-grade, weather-resistant steel paint, or Enamel applied and baked.
Live trees	6 inches	Wire not wrapped or stapled directly to tree. A wood slat is nailed to the side of the tree and the wires stapled to the slat		

Table 8 Brace Post Requirements for Standard Post and Wire Fence

Brace Post Type	Min. Diameter /Weight	Min. Setting Depths	Minimum Length	Other
Posts need not be new materials; however, all posts shall meet the minimum quality criteria for durability and protective coating and be sound and free from decay, with all limbs trimmed substantially flush with the body.. Posts shall be of sufficient length to meet setting depth, fence height requirements , plus 2 inches.				
Wood-juniper, cedar, black locust	5 inches	3 feet	7 feet	
Wood-pine or similar woods	5 inches	3 feet	7 feet	Complete penetration of the sapwood with ammonical-copper-arsenate, chromated-copper-arsenate mixture or other approved treatment materials. Treatment shall extend a minimum of 30 inches up the post from the butt.
Steel, round	2 3/8 inches outside diameter (OD), 3.65 lb./foot or equivalent	3 feet set in 12 inch diameter concrete	7 feet	Galvanized with 2 oz./square foot zinc coating Schedule 40 pipe will meet these requirements
Steel, angle iron	2.5-inch x 2.5 inch x 0.25 inch	3 feet set in 12 inch diameter concrete	7 feet	Galvanized with 2 oz./square foot zinc coating
Live trees	10 inches	Wire not wrapped or stapled directly to tree. Several wood slats spaced around the tree trunk provide protection if wire is wrapped around the tree.		

Table 9 Brace Member Requirements for Standard Post and Wire Fence

Brace Member Type	Minimum Diameter/Weight	Minimum Length	Other
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Wood, horizontal	4 inches	8 feet	
Wood, diagonal	4 inches	10 feet	
Steel, round, horizontal, pipe or tubular steel	1-5/8 in. OD, 2.25 lb./foot or equivalent	8 feet	
Steel, round, diagonal, pipe or tubular steel (when used with and all metal brace system)	1-5/8 in. OD, 2.25 lb./foot or equivalent	6 feet	Galvanized with 2 oz./square foot zinc coating
Steel, angle iron, diagonal (when used with and all metal brace system)	2 inch x 2 inch x 0.25-inch	6 feet	Galvanized with 2 oz./square foot zinc coating

NATURAL RESOURCES CONSERVATION SERVICE
GENERAL SPECIFICATION POWER FENCE

FENCE

(Feet)

CODE 382

GENERAL REQUIREMENTS

SCOPE

The work shall consist of furnishing materials and installing materials for the specified design at the location(s) shown on the plan map, drawings, or as staked in the field.

Fencing includes brace assemblies, gates, cattle guards, and other components required for meeting site conditions and achieving the objectives for the practice application.

TYPE OF FENCES

High Tensile Electric or Power Fence

Power, or electric, fence is an acceptable alternative to standard post-and-wire fencing. Livestock must be trained to respect a power fence if it is to be effective, particularly if less than three line wires are used.

Because of the potential hazards to humans, power fence should not be used in areas frequented by visitors. All power fencing shall have signs securely attached to the top wire at frequent intervals to warn people that the fence is charged. Barbed wire will be not be used in electrified fences because of the safety hazard.

Temporary Power Fence

Temporary fence may be used when the period of exclusion or control does not exceed 60 days.

**High Tensile Electric or Power Fence:
Materials and Construction Specifications**

Power Fence Materials

The materials used in construction must be in accordance with, and equal or exceed, in strength and durability, the requirements listed in the General Specification tables for this type fence. Posts must be of sufficient length to meet fence height, setting depth requirements, plus 3 inches.

Wood Line Posts and Steel Line Posts

Wood and steel line posts provide extra strength but require insulators when used.

Fiberglass and Plastic Line Post

Fiberglass posts are lighter than steel posts and withstand greater side-to-side stress. Polypropylene plastic posts have adequate strength but special clips or methods are needed to attach wire to the posts. Fiberglass and plastic posts will not rot but are extremely susceptible to damage by fire. Fiberglass and plastic posts do not need insulators.

Fiberglass posts shall be a composite of marble, fiberglass, and polymer resins that have been treated by thermosetting (heat treatment).

Energizer

Electronic energizers or power fence controllers are to meet the following minimum specifications:

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- 5,000-volt peak output, a pulse that is finished within 300 micro seconds or less, and 54 to 60 pulse per minute.
- High impact weather resistant cases.
- Lightning arrester.
- Solid state circuitry.
- Safety pace fuse.
- Be (UL listed) 110-volt, 220-volt, or a 6 or 12-volt battery powered system capable of operating 3 weeks without recharge.

The maximum length of wire per controller shall not exceed manufacturer's recommendation for the size and the type of wire and the controller used.

Portable volt meters to determine voltage on line are desirable for monitoring systems.

High Tensile Electric or Power Fence Construction Specifications

Setting posts

Wood posts shall be set in holes and backfilled with compacted earth, poured concrete, or wood posts shall be driven.

Fiberglass and plastic posts shall be driven or installed according to the manufacturer's directions.

Where postholes are dug, the holes shall be at least six (6) inches larger than the diameter of side dimensions of the posts. Earth backfill around posts shall be thoroughly tamped in layers not thicker than 4 inches and shall completely fill the posthole to the ground surface. Concrete backfill around posts shall be rodded into place in layers not thicker than twelve (12) inches and shall completely fill the posthole to ground surface. Backfill, either earth or concrete shall be crowned up around posts at the ground surface.

Concrete shall be class 3000 in accordance with Washington NRCS Construction Specification CS-42, Concrete for Minor Structures. Concrete shall be allowed to set for ten days before tension is applied to the brace assemblies through tightening of wire.

POST DEPTH

All posts shall be placed to the required depth and shall be firmly embedded so that there is less than 1 inch of horizontal movement at the top of post when a horizontal force of 80 lb. is applied.

Posts shall be set to the minimum depths listed in Table 13 Line Post Requirements or Table 14 Brace Post Requirements.

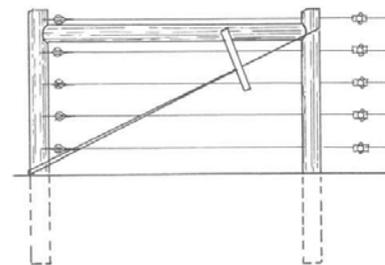
Line posts shall be driven solidly into the ground. The deeper a post is set the stronger the fence. If soil conditions prevent firmly setting line posts in the ground: rock-jacks, Figure-4's, or wire cribs may be used. If soil conditions prevent the proper setting of anchor posts and brace posts in the ground; rock-jacks or rock cribs may be used.

CORNER, BRACE AND GATEPOSTS

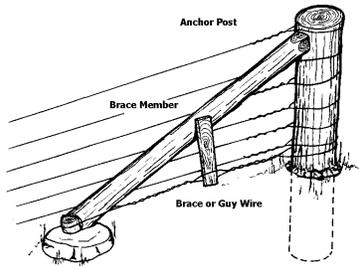
Bracing is the key determinant to the structural soundness and longevity of wire fences. Braces are required at all corners, gates, definite slope breaks, and changes in alignment to the line fence. Fence shall be reasonably straight and shall not deviate more than 12 inches between any corner, gate, or in-line brace assembly.

Brace Assembly Types and Nomenclature

Standard H-brace



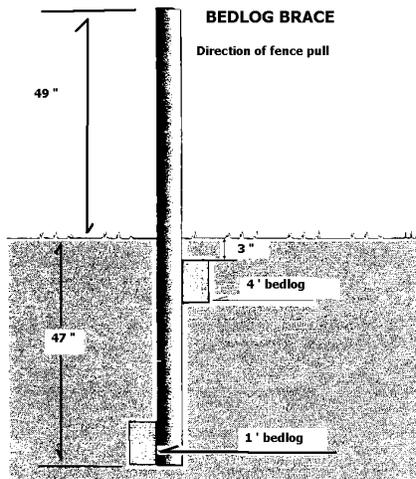
Diagonal Brace



around the anchor posts (pull posts), stapled, and secured with an appropriate tie-off type for high tensile wire.

Wooden horizontal brace members (compression braces) shall be at least 8 feet in length and notched into the top half of the brace post and post being braced (anchor post or pull post), approximately 36 inches above ground level.

Bed-Log Brace



The top end of wooden diagonal brace members shall be notched into the post being braced (anchor post or pull post) approximately 36 inches above ground level. Steel dowels can be used, rather than notching, to attach horizontal brace between anchor post and brace post

BRACING WIRE

Brace wires (or guy wires) shall be formed from two complete loops of:

- No. 9 gauge smooth wire,
- No. 12-1/2 gauge double-strand barbed or smooth wire, or
- No. 12-1/2 gauge high tensile smooth wire.

For bedlog braces:

- The brace post should be set to depth that is approximately one-half (1/2) the length of the brace post
- If the brace post is driven, the lower bedlog (1 foot) is not needed.
- The 4 foot bedlog should be driven into (supported by) undisturbed soil.
- The bedlog must be placed at a position to support the effective direction of the fence pull.

Brace wires shall extend from a point approximately six inches below the top of the brace post to about 4 inches above the ground level of the post being braced (anchor post or pull post). The brace wires shall be double-wrapped around each post, stapled and spliced together. A stout stick, pipe, or metal rod, about 18 to 24 inches long, is placed mid-way along the brace wires, and all four wires are twisted together so the brace wires tightly secure the compression brace and provide needed rigidity. If a diagonal brace is used, the tightening stick is positioned below the diagonal to avoid hitting this brace member as the stick is turned.

Tensioners may be used in lieu of the tightening stick.

In straight sections on moderate terrain, in-line brace units are required at intervals not to exceed 4000 feet.

All line wires shall be dead-ended on the anchor post (pull post) of gate, corner, and in-line brace assemblies. Wire ends are double wrapped

Line Post Spacing

Spacing is the same for all line post materials (metal, wood, etc.)

Table 10 Line Post & Stay Spacing

FENCE TYPE	LINE POST SPACING Maximum Interval
2-Wire Fence	100-foot centers, with or without stays.
3-Wire Fence or greater	75 feet without stays 100 feet with a stay midway between line post

FENCE HEIGHT and WIRE SPACING

Table 11 Fence Height and Wire Spacing

Intended Use	Fence Height and Line Wire Spacing
2 wire	Top wire height shall be at least 30 inches, with the grounded wire approximately 4 to 10 inches below the top wire.
3 wire	Top wire height of a three-wire fence shall be at least 36 inches
4 wire	Top wire height of a three-wire fence shall be at least 42 inches

Stays

Fiberglass stays of thermosetting reinforced composite consisting of marble fiberglass and high-polymer resins shall be used. Alternatively, stay may be of Australian ironwood.

SPLICING

When splicing of wire is necessary:

- High-tensile wire-"Figure-8", or

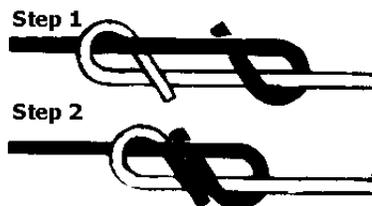


Figure-8 Splice

- compression fittings



To crimp wires together, overlap ends of each wire about two inches then place compression fittings over both wires and firmly crimp the fittings.

INSULATORS

Insulators shall be UV-stabilized black plastic, porcelain, or composite materials.

STAPLES

Staples shall be driven into the post at an angle in the same direction as the line wire is pulling. If the line wire pull is up, staple legs shall angle upwards when driven into the post. Staples shall be driven just deep enough to snug the line wire without bending it. The line wire shall be loose in the staple.

FENCE WIRE TENSION

Temperature variations must be considered when setting the tension on line wires (wire will tighten in cold weather and expand in hot weather). All line wires shall be dead-ended on gate, corner, or the anchor posts (pull posts) of in-line brace units.

CROSSING DRAWS OR STREAMS

Use an anchor when the bottom line wire is more than 20 inches above the ground at the low spot when crossing landscape depressions (draws or swales) shall be anchored to a weight or deadman equivalent to a 12-inch x 12-inch concrete block.

When crossing live streams or very deep draws, the fence shall be dead-ended on each side of the crossing by use of line braces. The section across the stream may be removable, a breakaway type, or swinging picket type fence.

OTHER FENCE COMPONENTS

Gates, rock cribs, fence stiles, wildlife fencing, and other fence component materials will follow the requirements of the Fence General Specification

INSTALLATION

Installation of the fence shall conform to the specifications and Exhibits or other drawings, as provided.

The completed job shall be workmanlike and present a good appearance. The installer and other persons will conduct all work in accordance with proper safety procedures.

Table 12 Wire Type Requirements for Power Fence

Wire Type	Minimum Wire Size	Minimum Protective Coating	Strand-breaking strength	Other
High Tensile Smooth single strand	12-1/2 gauge	Class III galvanized per ASTM-121	135,000 psi	Electrified

Table 13 Line Post Requirements for Power Fence

Line Post Type	Minimum Diameter/Weight	Minimum Setting Depths	Minimum Length	Minimum Protective Coating Other
Posts do not need to be new materials; however, all posts shall meet the minimum quality criteria for durability and protective coating. Wood posts need to be sound and free from decay, with all limbs trimmed substantially flush with the body				
Wood-juniper, cedar, black locust	3 inches	24 inches	6 feet	.
Wood-pine or similar woods	3 inches	24 inches	6 feet	Complete penetration of the sapwood with ammonical-copper-arsenate, chromated-copper-arsenate mixture or other approved treatment materials that extend a minimum of 30 inches up the post from the butt.
Australian ironwood	2 inches X 1 1/2 inches	24 inches	6	Electrified fence only
Standard "T" or "U" section steel . Rolled from high carbon steel and studded, embossed, or punched for wire attachment with anchor plate	1.0 pounds per foot of length, exclusive of anchor plates Electrified fence only	18 inches	5 1/2	Hot dip galvanized, or One or more coats of high-grade, weather-resistant steel paint, or Enamel applied and baked
Fiberglass "T" section	1 inches	24 inches	6 feet	Electrified fence only

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Line Post Type	Minimum Diameter/ Weight	Minimum Setting Depths	Minimum Length	Minimum Protective Coating Other
Fiberglass round section	1 inches	24 inches	6 feet	Electrified fence only
Plastic (Polypropylene) round section	3 inches	24 inches	6 feet	Electrified fence only

Table 14 Brace Post Requirements for Power Fence

Brace Post Type	Min. Diameter /Weight	Min. Setting Depths	Minimum	Minimum Protective Coating	Other
Sound and free from decay, with all limbs trimmed substantially flush with the body. Wood posts need not be new materials; however, all posts shall meet the minimum quality criteria for durability and protective coating.					
Wood-juniper, cedar, black locust	5 inches	3 feet	7 feet		
Wood-pine or similar woods	5 inches	3 feet	7 feet	Complete penetration of the sapwood with ammonical-copper-arsenate, chromated-copper-arsenate mixture or other approved treatment materials that extend a minimum of 42 inches up the post from the butt.	
Steel, round, 3.65 lb./foot or equivalent	2 3/8 inches outside diameter (OD)	3 feet set in 12 inch diameter concrete	7 feet	Galvanized with 2 oz./square foot zinc coating Schedule 40 pipe will meet these requirements	
Steel, angle iron	2.5-inch x 2.5 inch x 0.25 inch	3 feet set in 12 inch diameter concrete	7 feet	Galvanized with 2 oz./square foot zinc coating	
Specialty Hardware	Temporary Electrified Fence only	Specialty hardware is commercially available that allows the use of standard steel fence posts in design of fence end, in-line and corner brace structures. Some of these alternative types of brace configurations have demonstrated ample strength and may be used			

Table 15 Brace Member Requirements for Power Fence

Brace Member Type	Minimum Diameter/Weight	Minimum Length	Minimum Protective Coating	Other
Wood, horizontal	4 inches	8 feet		
Wood, diagonal	4 inches	10 feet		
Steel, round, horizontal, pipe or tubular steel	1-5/8 in. OD, 2.25 lb./foot or equivalent	8 feet	Galvanized with 2 oz./square foot zinc coating	
Steel, round, diagonal, pipe or tubular steel	1-5/8 in. OD, 2.25 lb./foot or equivalent	6 feet		
Steel, angle iron, diagonal	2 inch x 2 inch x 0.25-inch	6 feet		

NATURAL RESOURCES CONSERVATION SERVICE
GENERAL SPECIFICATION WOVEN WIRE FENCE

FENCE

(Feet)

CODE 382

GENERAL REQUIREMENTS

SCOPE

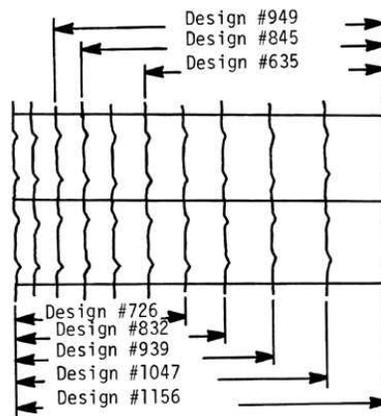
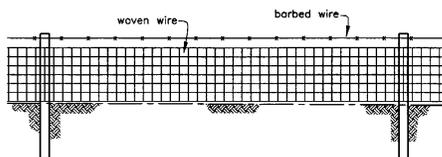
The work shall consist of furnishing materials and installing materials for the specified design at the location(s) shown on the plan map, drawings, or as staked in the field.

Fencing includes brace assemblies, gates, cattle guards, and other components required for meeting site conditions and achieving the objectives for the practice application.

TYPE OF FENCES

Woven-wire

Woven-wire fence is best used in areas where tight control is necessary: sheep, goats, horses, hogs, people, wildlife depredation, or predator control. Woven-wire fences consist of woven-wire stretched between line posts. The spacing of the mesh of the woven-wire differs, depending on the kind of animals the fence is designed to control. Woven-wire fences can be adapted to most terrain, but are not well suited to areas of heavy snow loads.



Each woven-wire fence type has a fence tag with a design number that accurately describes the configuration of the fencing material. In the "Design No.",

- the first one or two numbers relate the number of line wires;
- the next two numbers to the right specify the height of the wire in inches;
- the next to last number grouping (either the number 6 or the number 12) identifies the spacing of vertical stay wires;
- And the final one or two numbers give the gauge of intermediate wires.

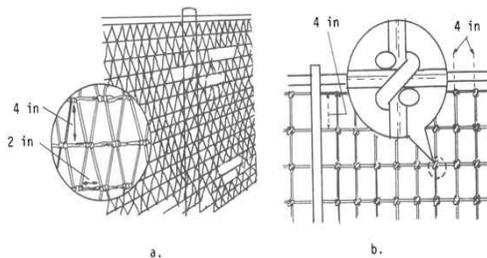
For example, woven wire with "Design No. 726-12-11 ", has 7 line wires, is 26 inches high, the vertical stays are spaced 12 inches apart, and the intermediate wires are No. 11 gauge. Intermediate or filler wires include the

horizontal line wires and all the vertical stay wires between the top and bottom wires.

Woven wire is not safe for wildlife

Mesh Fence

Mesh fences, such as horse-no-climb, is used for confinement fencing-corrals, feed lots, and small acreage areas. No-Climb types of configurations are used for camelids and horses to prevent fence damage and potential injury to the animal.



Chain Link

Chain link systems are preferred when the intent of the fence is to control human access.

MATERIALS AND CONSTRUCTION SPECIFICATIONS

Materials Specifications

The materials used in construction must be in accordance with, and equal or exceed, in strength and durability, the requirements listed in the General Specification tables for this type fence.

Line Posts

Line and brace post holes for chain link fence must be steel and set in concrete.

Brace Assemblies

Woven and Mesh Wire

Wooden horizontal brace members (compression braces) shall be at least 8 feet in length and notched into the top half of the brace post and post being braced (anchor post or pull post), approximately 36 inches above ground level.

The top end of wooden diagonal brace members shall be notched into the post being braced (anchor post or pull post) approximately 36 inches above ground level. Steel dowels can be used, rather than notching, to attach horizontal brace between anchor post and brace post

Chain Link

As in Washington Standard Drawing LSK-0050, LSK-0051, LSK-0052, and LSK-0053.

Construction Specifications

Setting posts

Wood posts shall be set in holes and backfilled with compacted earth, poured concrete, or wood posts shall be driven.

Where postholes are dug, the holes shall be at least six (6) inches larger than the diameter of side dimensions of the posts. Earth backfill around posts shall be thoroughly tamped in layers not thicker than 4 inches and shall completely fill the posthole to the ground surface. Concrete backfill around posts shall be rodded into place in layers not thicker than twelve (12) inches and shall completely fill the posthole to ground surface. Backfill, either earth or concrete shall be crowned up around posts at the ground surface.

Concrete shall be class 3000 in accordance with Washington NRCS Construction Specification CS-42, Concrete for Minor Structures. Concrete shall be allowed to set for ten days before tension is applied to the brace assemblies through tightening of wire.

GS-382 Woven Wire Fence

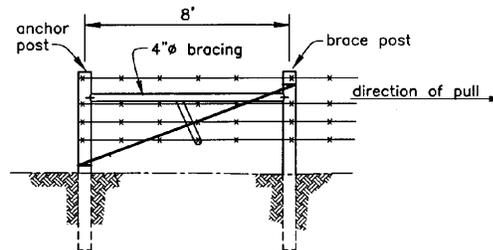
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POST DEPTH

All posts shall be placed to the required depth and shall be firmly embedded so that there is less than 1 inch of horizontal movement at the top of post when a horizontal force of 80 lb. is applied.

Posts shall be set to the minimum depths listed in Table 21 Brace Post Requirements or Table 21 Brace Post Requirements.

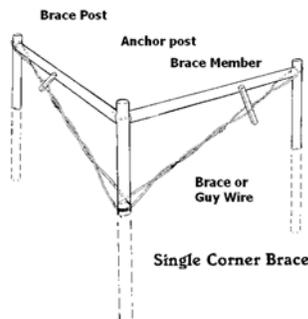
Steel line posts shall be driven solidly into the ground. The deeper a post is set, the stronger the fence. If soil conditions prevent firmly setting line posts in the ground: rock-jacks, Figure-4's, or wire cribs may be used. If soil conditions prevent the proper setting of anchor posts and brace posts in the ground; rock-jacks or rock cribs may be used.



1—SPAN END

CORNER, BRACE AND GATEPOSTS

Bracing is the key determinant to the structural soundness and longevity of wire fences. Braces are required at all corners, gates, and at all definite slope breaks and changes in alignment to the line fence. Fence shall be reasonably straight and shall not deviate more than 12 inches between any corner, gate, or in-line brace assembly.



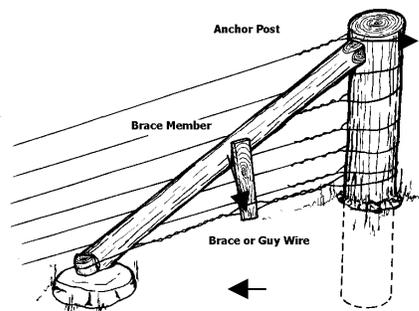
Brace Assembly Types and Nomenclature

CORNER, BRACE AND GATEPOSTS

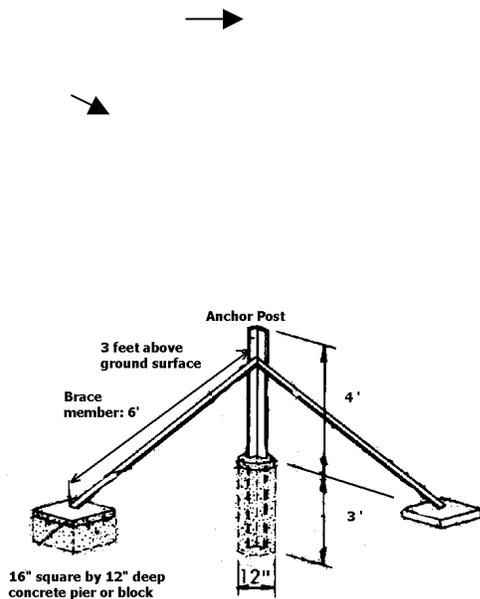
Brace Assembly Types and Nomenclature for Woven and Mesh Wire

Standard H-brace

Diagonal Brace



Metal Brace



Chain Link Brace Posts shall be constructed per Washington Standard Drawing LSK-0051.

In straight sections on moderate terrain, in-line brace units are required at intervals not to exceed:

Table 16 Brace Intervals

FENCE TYPE	DISTANCE (feet)
Standard Woven Wire Fence	330 feet (20 rods).
Mesh Fence	The roll length of the material
Chain Link	The roll length of the material

Woven Wire

To attach woven-wire to posts at wire end points, first determine the approximate length of wire that is needed to wrap the wire around the post two times. Remove enough vertical stay wires to provide the needed amount of line wire. Cut the vertical stay wires between the horizontal line wires. If the woven-wire has hinge joints, loosen the hinge joints and slip them off the end of line wires. Wire ends are then double wrapped

around the anchor posts or (pull posts), stapled, and twisted back on the stretched line wire with at least six tight wraps. A spring action is built into most woven-wire by using tension curves configured as a "U"-shaped crimp in the line wire. Stretch woven-wire so that about one-third of the wire tension curve is removed.

Mesh Wire

Per Manufacturer's recommendations

Chain Link

BRACING WIRE

Brace wires (or guy wires) shall be formed from two complete loops of:

- No. 9 gauge smooth wire,
- No. 12-1/2 gauge double-strand barbed or smooth wire, or
- No. 12-1/2 gauge high tensile smooth wire.

Brace wires shall extend from a point approximately six inches below the top of the brace post to about 4 inches above the ground level of the post being braced (anchor post or pull post). The brace wires shall be double-wrapped around each post, stapled and spliced together. A stout stick, pipe, or metal rod, about 18 to 24 inches long, is placed mid-way along the brace wires, and all four wires are twisted together so the brace wires tightly secure the compression brace and provide needed rigidity. If a diagonal brace is used, the tightening stick is positioned below the diagonal to avoid hitting this brace member as the stick is turned. Tensioners may be used in lieu of the tightening stick.

Line Post Spacing

Spacing is the same for all line post materials (metal, wood, etc.)

GS-382 Woven Wire Fence
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Table 17 Line Post & Stay Spacing

FENCE TYPE	LINE POST SPACING Maximum Interval
Woven Wire	20 feet maximum
Mesh Wire	20 feet maximum
Chain Link	10 feet maximum

FENCE HEIGHT and WIRE SPACING

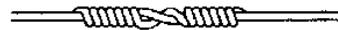
Table 18 Fence Spacing

Intended Use	Fence Spacing
Woven wire, mesh wire	Ground to Bottom of woven wire: 1/2-inch minimum to 3 inch maximum. Use the maximum if a barbed wire line is used under the woven wire. Added smooth or barbed wire at the top: 4-6 inches.
Chain Link	Ground to bottom of chain link: 2 inches

SPLICING

When splicing of wire is necessary:

- Western Union Splice or



WESTERN UNION SPLICE

- compression fittings



At least Two Compression Connectors per Splice

To crimp wires together, overlap ends of each wire about two inches then place compression fittings over both wires and firmly crimp the fittings.

STAPLES

Staples shall be driven into the post at an angle in the same direction as the line wire is pulling. If the line wire pull is up, staple legs shall angle upwards when driven into the post. Staples shall be driven just deep enough to snug the line wire without bending it. The line wire shall be loose in the staple.

FENCE WIRE TENSION

Temperature variations must be considered when setting the tension on line wires (wire will tighten in cold weather and expand in hot weather). All woven and mesh line wires shall be dead-ended on gate, corner, or the anchor posts (pull posts) of in-line brace units.

CROSSING DRAWS OR STREAMS

Use an anchor when the bottom line wire is more than 20 inches above the ground at the low spot when crossing landscape depressions (draws or swales). All fence strands shall be anchored with No. 9 gauge, galvanized, smooth wire (or equivalent) to a weight or deadman equivalent to a 12-inch x 12-inch concrete block.

When crossing live streams or very deep draws, the fence shall be dead-ended on each side of the crossing by use of line braces. The section across the stream may be removable, a breakaway type, or swinging picket type fence.

OTHER FENCE COMPONENTS

Gates, rock cribs, fence stiles, wildlife fencing, and other fence component materials will follow the requirements of this General Specification

INSTALLATION

Installation of the fence shall conform to the specifications and Exhibits or other drawings, as provided.

The completed job shall be workmanlike and present a good appearance. The installer and other persons will conduct all work in accordance with proper safety procedures.

Table 19 Wire Type Requirements for Woven Wire Fence

Wire Type	Minimum Wire Size	Minimum Protective Coating	Strand-breaking strength	Other
Standard Woven Wire The label shall indicate the wire meets ASTM A-116 or ASTM A-584 standards.	Top & Bottom wires: 10 gauge Intermediate & Stay Wires: 12-1/2 gauge	Class I zinc coating or equivalent	32 inches minimum to 42-inch maximum height with 6 inch spacing between stay wires.	At least one strand of barbed or other wire will be added at the top spaced 2-6 inches above the woven wire.
High Tensile Woven Wire	14 1/2 gauge	Class III zinc coating or equivalent	32 inches minimum to 42-inch maximum height with 6 inch spacing between stay wires.	At least one strand of barbed or other wire will be added at the top spaced 2-6 inches above the woven wire.
Mesh Wire; such as Horse-No-Climb	Top & Bottom wires: 10 gauge Intermediate & Stay Wires: 12-1/2 gauge	Class I zinc coating or equivalent	At least 48 inch high, less than or equal to 2 inch x 4-inch mesh spacing.	At least one strand of other wire will be added at the top spaced 2-6 inches above the woven wire.
Chain Link	No. 9 gauge with the manufacturer's identification tag and consist of 2-inch diamond shape in which the individual pickets are helical wound and interwoven to form a continuous link fabric	Class II per ASTM A392	At least 48 inches high	

GS-382 Woven Wire Fence

Table 20 Line Post Requirements for Woven Wire Fence

Line Post Type	Minimum Diameter/ Weight	Minimum Setting Depths	Minimum Length	Minimum Protective Coating Other
Posts do not need to be new materials; however, all posts shall meet the minimum quality criteria for durability and protective coating. Wood posts need to be sound and free from decay, with all limbs trimmed substantially flush with the body.				
Wood-juniper, cedar, black locust	3 inches at a point 2 inches above the top wire	24 inches	6 feet	
Wood-pine or similar woods	3 inches at a point 2 inches above the top wire	24 inches	6 feet	Complete penetration of the sapwood with ammonical-copper-arsenate, chromated-copper-arsenate mixture or other approved treatment materials that shall extend a minimum of 30 inches up the post from the butt.
Standard "T" or "U" section steel Rolled from high carbon steel and studded, embossed, or punched for wire attachment with anchor plate	1.25 pounds per foot of length, exclusive of anchor plates	18 inches	5 1/2	Hot dip galvanized, or One or more coats of high-grade, weather-resistant steel paint, or enamel applied and baked.
Live trees	6 inches	Wire not wrapped or stapled directly to tree. A wood slat is nailed to the side of the tree and the wires stapled to the slat		

Table 21 Brace Post Requirements for Woven Wire Fence

Brace Post Type	Min. Diameter /Weight	Min. Setting Depths	Minimum Length	Minimum Protective Coating	Other
Wood posts need not be new materials; however, all posts shall meet the minimum quality criteria for durability and protective coating. Sound and free from decay, with all limbs trimmed substantially flush with the body					
Wood-juniper, cedar, black locust	5 inches	3 feet	7 feet		
Wood-pine or similar woods	5 inches	3 feet	7 feet	Complete penetration of the sapwood with ammonical-copper-arsenate, chromated-copper-arsenate mixture or other approved treatment materials that shall extend a minimum of 42 inches up the post from the butt.	
Steel, round, 3.65 lb./foot or equivalent	2 3/8 inches outside diameter (OD),	3 feet set in 12 inch diameter concrete	7 feet	Galvanized with 2 oz./square foot zinc coating	Schedule 40 pipe will meet these requirements
Steel, angle iron	2.5-inch x 2.5 inch x 0.25 inch	3 feet set in 12 inch diameter concrete	7 feet		
Live trees	10 inches	Wire not wrapped or stapled directly to tree. Several wood slats spaced around the tree trunk provide protection if wire is wrapped around the tree.			

Table 22 Brace Member Requirements for Woven Wire Fence

Brace Member Type	Minimum Diameter/Weight	Minimum Length	Minimum Protective Coating	Other
Wood, horizontal	4 inches	8 feet		
Wood, diagonal	4 inches	10 feet		Diagonal Brace Only
Steel, round, horizontal, pipe or tubular steel	1-5/8 in. OD, 2.25 lb./foot or equivalent	8 feet		
Steel, round, diagonal, pipe or tubular steel	1-5/8 in. OD, 2.25 lb./foot or equivalent	6 feet	Galvanized with 2 oz./square foot zinc coating	Metal Brace Only
Steel, angle iron, diagonal	2 inch x 2 inch x 0.25-inch	6 feet		

NATURAL RESOURCES CONSERVATION SERVICE
GENERAL SPECIFICATION ROCK-JACK AND FIGURE-4 FENCE

FENCE

(Feet)

CODE 382

GENERAL REQUIREMENTS

SCOPE

The work shall consist of furnishing materials and installing materials for the specified design at the location(s) shown on the plan map, drawings, or as staked in the field.

Fencing includes brace assemblies, gates, cattle guards, and other components required for meeting site conditions and achieving the objectives for the practice application.

TYPE OF FENCES

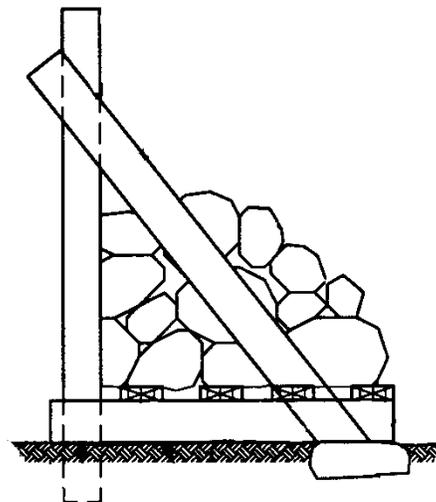
Rock-jack and Figure-4 Fence

Rock-jack and Figure-4 fences are highly functional and usually have minimal maintenance requirements. These fences are particularly useful in areas where it is difficult to set regular posts, such as swampy or rocky areas. Rock-jacks provide the primary fence support in lieu of brace and end post assemblies. An alternative system of wire supports, in the configuration of the number 4, is used in lieu of line posts to provide wire support. Figure-4's, steel posts, and fence stays can be used in combination to suit site conditions.

Rock-jack and Figure-4 fences should be considered for use in areas where raw materials are available onsite and when construction and maintenance costs will be less than fences with set posts.

ROCK-JACK AND FIGURE-4 FENCE

MATERIALS SPECIFICATIONS



Rock-jacks are constructed from either dimension lumber, round posts or split poles.

CONSTRUCTION: ROCK-JACK AND FIGURE-4 FENCE

See Washington Standard Drawing LSK-0260

ROCK-JACKS

For Rock jacks used as line posts in a fence line:

Rock Jack Components	Dimensions	Length
Anchor Post	4 inch x 4 inch dimensional lumber or 6 inch diameter post	5 1/2 feet
Diagonal Braces (legs)	2" x 6" dimensional lumber, or 3" x 6" round posts or 3" x 6" split poles	5 feet 8 inches
Base Supports		4 feet
Flooring	2" x 6" dimensional lumber	4 feet, 3.5 feet, 3 feet, & 2.5 feet

For Rock-jacks that are used at fence corners, gates, pull post locations, or other locations where extra support is needed:

Rock Jack Components	Dimensions	Length
Anchor Post	6 inch x 6 inch dimensional lumber or 6 inch diameter post	5 1/2 feet, may be longer depending on gate design
Diagonal Braces (legs)	2" x 6" dimensional lumber, or 3" x 6" round posts or 3" x 6" split poles	8 feet
Base Supports		5 feet 8 inches
Flooring	2" x 6" dimensional lumber	5.5 feet, 5 feet, 4.5 feet, 4 feet, 3.5 feet, 3 feet & 2.5 feet

The anchor post is set in the ground to a one-foot depth. If soil conditions prevent setting anchor post, rock cribs can be used. The anchor post has sufficient length that at least 4-1/2 feet of post rises above the ground level when set.

All joints shall be notched for a snug fit and to allow one-half of each nail length to be driven into or through each piece. Two 40d or 50d galvanized nails are used to attach the diagonal braces (legs) to the anchor posts. All other nails at joints will have a minimum of 2 1/2 inches of nail penetration into the receiving piece.

Floor joists may overlap and can be attached on the same side of the anchor post as the diagonal braces. The end of the floor support joists shall rest solidly on rocks situated to provide additional frame support.

At gates or fence ends, the diagonal braces are set perpendicular to each other with one brace parallel to fence line. At corners, the diagonal braces are set parallel to each fence line.

Corners wider than 90 degrees may need additional braces and support joists.

The outer end of each diagonal brace shall be placed in a shallow hole dug in the ground to help prevent brace movement.

The floor of the rock-jack shall be constructed of 2-inch x 6-inch boards. Do not nail the platform down. Once the rock-jack frame is constructed and the floorboards are in place, rocks are placed on the rock-jack floor. Large rock weights will be placed at each joint with lesser weight rock distributed evenly over the rock platform. Weight of rock on the platform is 300 to 500 pounds. Line wires are stapled to the anchor post of the line rock-jack. Rock-jacks used for gate, corner, or pull post locations will have the wire wrapped around the anchor post.

FIGURE-4'S

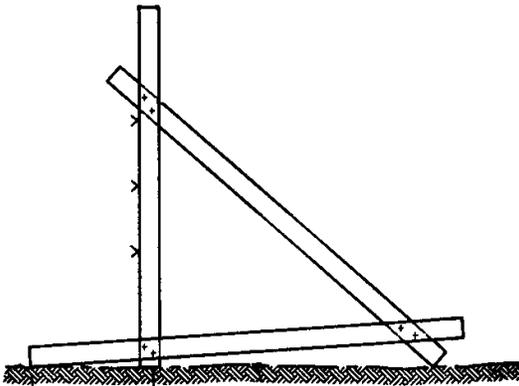


Figure 4 fence supports are constructed from either dimension lumber, round, or split poles. Figure-4 supports are composed of 3 frame members: vertical post, diagonal brace, and ground leg.

The upright post shall be at least four feet in length. The diagonal brace and ground leg of the support frame shall each be 5-1/2 feet long. A recommended construction design employs 2-inch x 6-inch boards for each member of the figure-4 support. The bottom end of the vertical post rests on the ground surface. Fasten the diagonal brace to the vertical post at a point approximately 8-inches below the top of the post. Extend the diagonal brace several inches past the vertical post. The end of the diagonal brace pointed away from the fence line rests on the ground surface. The fence line end of the ground leg is attached to the bottom of the vertical post so that about 1-1/2 feet extends past the post. The distance from the end of the ground leg pointed away from the fence, to the midpoint of the post, will then be about four feet. Fasten the ground leg to the

vertical post above the ground surface and below the bottom line wire. The outer end of the ground leg is attached to the diagonal brace at a point 10 to 12 inches above the groundline. Two 40d nails are driven into or through figure-4 frame members at each joint. Line wire strands are stapled to the upright post member of the figure-4 support frame.

In wet or swampy areas, a pair of 3 to 4-inch diameter poles can replace the single ground leg frame member of the figure-4 described above. These poles are attached to the bottom of either side of the post and diagonal brace to act as floaters and keep the post from sinking into the wet ground.

ROCK-JACK, FIGURE-4, AND LINE POST SPACING

Rock-jacks are placed at all abrupt breaks in topography and definite changes in alignment to the fence line.

snow conditions and type of intermediate supports	In-line rock-jacks (line-jacks) spacing
--	--

Level (rocky or swampy) sites with light snowfall	100-foot intervals and figure-4's set every 25 feet with a stay (wood, wire, fiberglass) placed midway between each figure-4
moderately steep topography and/or areas of moderate snowfall	75-foot intervals with stays (wood or fiberglass) spaced at 12-and-one-half-foot intervals between rock-jacks.
steep, rocky slopes, or sites with heavy snow loads	50-foot intervals and Figure-4's are set 25 feet from each rock-jack with a wooden stay placed midway between a figure-4
On sites where steel posts can be driven	160-foot intervals and steel posts are set at 20-foot intervals between rock-jacks. A stay is placed mid-way (10 feet) between steel posts

INSTALLATION

Installation of the fence shall conform to the specifications and Exhibits or other drawings, as provided.

The completed job shall be workmanlike and present a good appearance. The installer and other persons will conduct all work in accordance with proper safety procedures.

NATURAL RESOURCES CONSERVATION SERVICE
GENERAL SPECIFICATION WOODEN BOARD FENCE

FENCE

(Feet)

CODE 382

GENERAL REQUIREMENTS

SCOPE

The work shall consist of furnishing materials and installing materials for the specified design at the location(s) shown on the plan map, drawings, or as staked in the field.

Fencing includes brace assemblies, gates, cattle guards, and other components required for meeting site conditions and achieving the objectives for the practice application.

TYPE OF FENCES

Wooden Board Fence

There are several types of wooden fence designs that are neat in appearance but require a lot of maintenance. Wooden fences are not widely used because of the expense of labor and materials. However, in some cases, all wood fences are more suited for aesthetic reasons or animal control purposes.

WOODEN BOARD FENCE: Materials and Construction Specifications

Wooden boards

The boards shall be Douglas fir, western larch, southern yellow pine, white oak, or other wood of equal life and strength.

The boards shall be at least 1 inch thick and at least six (6) inches wide (nominal). Board

lengths of sixteen (16) feet are more desirable so as to stagger the unions when placed on posts in 8-foot centers. For corrals or barn lots, 2-inch thick by at least eight- (8) inch wide (nominal) is required.

Lumber shall be painted or treated with creosote or comparable preservative. If painting is desired, lumber shall be treated with an anti-fungal agent in a light oil (mineral spirits or kerosene) or a waterborne preservative such as acid copper chromate or chromated zinc chloride.

Alternative materials may be used when the manufacturer's literature certifies the materials equal or exceed in strength and durability wooden boards.

Where appropriate, materials other than the wooden fence materials will be in accordance with standard post-and-wire fence specifications.

Posts

Posts will meet or exceed the requirements of Table 23 Post Requirements

Fasteners

Nails shall be galvanized or cadmium coated 16-d to 20-d nails for 2-inch stock or 3 3/4 inches long for 1-inch boards. Deformed shank (flute, screw, helically threaded or annually threaded) aluminum or galvanized hardened nails are also acceptable.

CONSTRUCTION: WOODEN BOARD FENCE

Where wooden fences are to accommodate deer traffic, they shall not exceed 42 inches in height.

Wooden boards

The union joints shall be staggered so that no more than one-half (1/2) the number of board rails on a fence post is a butt joint. This staggering of unions provides additional strength to the fence system. Wood surfaces shall be painted or treated with a preservative material for protection against rot. Boards shall be flat and fit tight against the post.

NAILING

Nail holes shall be predrilled into the boards to prevent splitting. If using dense hardwood posts, nail in a diamond shape whenever possible to keep the wood from splitting. The drill bit shall be slightly smaller than the nail. The nails shall be driven perpendicular to the grain of the wood (not toenailed). Each board shall be attached with three nails.

POST DEPTH

Wooden line posts shall be set solidly in the ground a minimum depth of 36 inches in the ground. The deeper a post is set, the stronger it will be. If soil conditions prevent the proper setting of posts in the ground, rock-jacks may be used.

POST SPACING

8 feet maximum post interval.

FENCE HEIGHT and BOARD SPACING

The intended use of the fence determines fence height and board spacing. The minimum spacing between boards is 6 inches. The bottom board shall be at least 5 inches above ground level.

INSTALLATION

Installation of the fence shall conform to the specifications and Exhibits or other drawings, as provided.

The completed job shall be workmanlike and present a good appearance. The installer and other persons will conduct all work in accordance with proper safety procedures.

Table 23 Post Requirements for Wooden Board Fence

Post Type	Min. Diameter /Weight	Min. Setting Depths	Minimum Length	Other
Posts need not be new materials; however, all posts shall meet the minimum quality criteria for durability and protective coating. Sound and free from decay, with all limbs trimmed substantially flush with the body				
Wood-juniper, cedar, black locust	5 inches	3 feet	Fence Design Height + 3 feet	Flat face for nailing.

GS-382 Wooden Board Fence
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Post Type	Min. Diameter /Weight	Min. Setting Depths	Minimum Length	Other
Wood-pine or similar woods	5 inches	3 feet	Fence Design Height + 3 feet	Complete penetration of the sapwood with ammonical-copper-arsenate, chromated-copper-arsenate mixture or other approved treatment materials that extend a minimum of 42 inches up the post from the butt. Flat face for nailing.

**NATURAL RESOURCES CONSERVATION SERVICE
GENERAL SPECIFICATION POST AND TIMBER FENCE**

FENCE

(Feet)

CODE 382

GENERAL REQUIREMENTS

SCOPE

The work shall consist of furnishing materials and installing materials for the specified design at the location(s) shown on the plan map, drawings, or as staked in the field.

Fencing includes brace assemblies, gates, cattle guards, and other components required for meeting site conditions and achieving the objectives for the practice application.

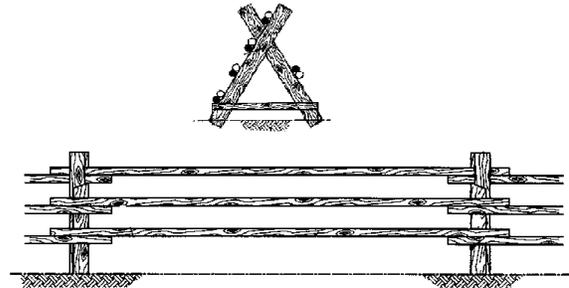
TYPE OF FENCES

Post and Timber Fence

There are several types of post and timber fence designs that are rustic in appearance and require relatively little maintenance, including:

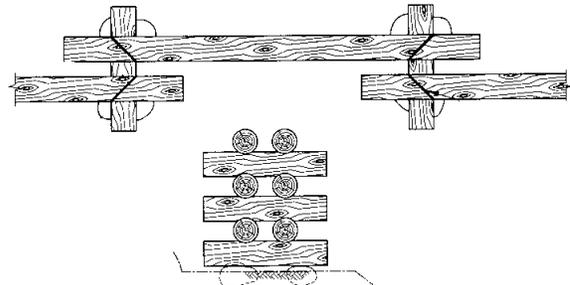
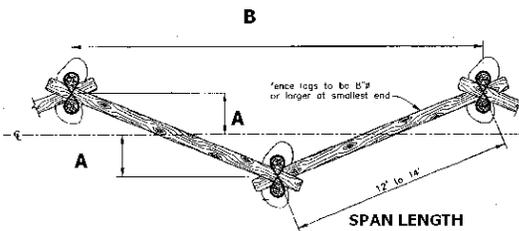
BUCK-POLE FENCES

Buck-Pole fences are suitable for camp grounds and recreation areas with high scenic values. This fence design is adapted to sites with high snow accumulation.



WORM FENCES

Worm fences have a zigzag appearance because each section is constructed at an angle to the previous section. This fence design is well suited to areas of high snow accumulation. Log-worm fences are highly functional and usually have minimal maintenance requirements. These fences are particularly useful in areas where it is difficult to set regular posts, such as swampy or rocky areas.



LOG-AND-BLOCK FENCES

Log-and-Block fences are similar to the log-worm fence, but the spans are shorter and the material is usually sized larger. This fence design is appropriate for areas of deep, drifting, snow and where appearance and durability are important concerns.

POST AND TIMBER FENCES

Materials Specifications

Where appropriate, materials other than the timber poles and posts (primary fence supports), will be in accordance with conventional post-and-wire fence specifications.

The materials used in construction must be in accordance with, and equal or exceed, in strength and durability, the following specifications:

BUCK-POLE FENCES

All poles and bucks shall be of sound wood that is round and free of knots. All poles and bucks shall have the bark stripped on three (3) sides to hasten seasoning.

Timber for bucks shall be at least 6 inches in diameter at the small end. Timber for bucks shall be at least five (5) feet in length.

Poles shall be at least 3 inches in diameter at the small end. Brace poles have a minimum diameter of 4 inches.

Poles shall be two (2) feet longer than the panel design length.

14	12	2 foot-3 inches	22 feet-3 inches
16	14	2 foot-8 inches	25 feet-10 inches

Table 24 Pole Length

Type of Pole	Panel Length	Pole Length
Green	10-12 feet	12-14 feet
Seasoned	14-16 feet	16-18 feet

Wire used for guy wire bracing shall be No. 9 gauge, galvanized.

60d spikes shall be used for buck construction and to attach poles to bucks.

WORM FENCES

(See Washington Standard Drawings: LSK-0272)

Logs used in fence construction shall have minimum taper and be at least eight (8) inches in diameter at the smallest end. Treated wooden stays at least 4 inches in diameter, treated 4-inch x 4-inch dimension lumber, or untreated 8 inch diameter or larger posts are used to support the logs.

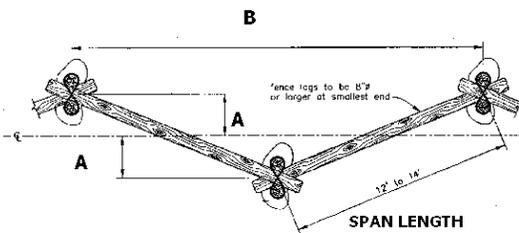


Table 25 Design Criteria with Stays

Log Length	Span Length	A	B
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Table 26 Design Criteria without Stays

Log Length	Span Length	A	B
14	12	>3 feet	<20 feet-9 inches
16	14	>3.5 feet	<24 feet-3 inches
18	16	>4 feet	<27 feet-8 inches

Wire used for shall be No. 9 gauge, galvanized.

LOG-AND-BLOCK FENCES

(See Washington Standard Drawings: LSK-0271)

Logs used in fence construction shall have minimum taper and be at least 8 inches in diameter. Logs used in the main fence spans are 10 to 14 feet long. Logs used in block sections are a minimum of 4 feet long. Treated wooden stays at least 4 inches in diameter or treated 4-inch x 4-inch dimension lumber are used to support the logs.

Large rocks are used to keep the bottom logs above the ground.

Construction Specifications

BUCK-POLE FENCES

(See Washington Standard Drawings: LSK-0273 and LSK-0274)

Bucks are spaced 10-12 feet apart for green poles. Bucks may be spaced 14-16 feet apart for seasoned poles.

Double brace poles shall be placed on every tenth (10) buck, except on steep slopes or heavy snow areas where every fifth (5) panel may need to be braced. Double guy wire bracing may be substituted for brace poles when a rock or log deadman can be buried at least sixteen (16) inches deep.

Bucks are mortised for a tight fit and to provide rigidity. Bucks are notched twelve (12) inches

from the top of each buck post. The notch is a dap joint approximately two (2) inches deep. Buck members are spread at an angle not less than 60°. Angle should be 80° on untimbered terrain where fence will be subjected to high winds

The top pole shall be greater than 3 feet and less than 4 feet high for livestock control or 6 feet high for deer control.

A top wire on the buck-and pole-fence may be used for deer exclusion.

For livestock control, the bottom pole of a four (4) pole fence shall be set 8 inches above the ground line with the remaining poles evenly distributed. For livestock control, the bottom pole of a four (4) pole fence shall be set 12 inches above the ground line with the remaining poles evenly distributed. The top pole commonly rests in the notch of the buck.

On the side of the buck opposite the poles, one rub pole shall be place two (2) feet above ground level.

WORM FENCES

(See Washington Standard Drawings: LSK-0272)

Each section of a worm fence is constructed at an angle to the previous section - the sharper the angle, the greater the fence strength and stability (see Table 25 Design Criteria with Stays and Table 26 Design Criteria without Stays

Span sections are 12 to 16 feet long, with one foot extending beyond span crossing points. The bottom poles of a worm type fence shall be raised off the ground using relatively flat rocks that are wider than the bottom pole (minimum of 6 "x12"x16"). Rocks are placed at section ends, and in the section center if the log sags excessively. Short sections of logs, 16 inches in diameter and 4 feet, long may be substituted for the bottom pole rock.

Stays may be omitted if the fence width is increased per the design parameters in Table 26 Design Criteria without Stays. Stays are tied

together at the bottom and top using No. 9 gauge smooth wire, double wrapped, and stapled to each stay.

Worm fences shall be at least three feet high and not more than four feet high (at the lowest span) for livestock control or six feet high for deer control

LOG-AND-BLOCK FENCES

(See Washington Standard Drawings: LSK-0271)

The Log-and-Block fence is constructed similar to the worm fence, except that short fence sections are set at right angles to the main sections for added fence stability

Span lengths of the main fence sections shall not be more than 12 feet (16 foot log).

Block sections have a minimum span of 42 inches. All log ends have a two-foot overlap. Blocks to have narrow notch on top and bottom side. Block sections must be level.

The largest diameter logs are used for the bottom fence members and the smallest logs for the top tiers. Logs must fit snugly.

Logs are attached to the blocks with 12" spikes. The ends of each top log in a main fence span is tied to the top log of the associated block and stays using No. 9 gauge smooth wire, double wrapped, and stapled to logs and stays.

The bottom logs of a block-and-pole type fence shall be raised off the ground by means of large rocks at section ends and at the center of each main span. The bottom log shall be raised above the ground line no more than 14 inches.

The number of logs is dependent on the size used. Block-and-pole fences are generally constructed at least 4-1/2 feet high. Fences over 42 inches high can be a barrier to deer and elk. Sections of letdown, or post-and-wire fence can be installed to allow seasonal passage of big game.

INSTALLATION

Installation of the fence shall conform to the specifications and Exhibits or other drawings, as provided.

The completed job shall be workmanlike and present a good appearance. The installer and other persons will conduct all work in accordance with proper safety procedures.