

FENCING ITEMS

ITEM F-160 WIRE FENCE WITH WOOD POSTS (CLASS A AND B FENCES)

DESCRIPTION

160-1.1 This item covers the requirements for furnishing materials and constructing wire fences and gates with wood posts according to the details included herein and as shown on the Plans. The class of fence to be erected shall be either Class A, woven wire fencing topped by 2 strands of barbed wire, or Class B, 4 strands of barbed wire, as specified.

MATERIALS

160-2.1 WIRE.

- a. **Woven Wire (Zinc-coated).** Woven wire fabric shall meet AASHTO M 279, Design Number 726-6-12 ½, Grade 60, Coating Type Z, and Coating Class 3.
- b. **Barbed Wire (Zinc-coated).** Barbed wire shall meet AASHTO M 280, Design Number 12-4-5-14R, Standard Grade, Coating Type Z, and Coating Class 3.
- c. **Barbed Wire (Aluminum-coated).** Barbed wire shall meet AASHTO M 280, Design Number 12-4-5-14R, Standard Grade, Coating Type ZA, and Coating Class 60.
- d. **Bracing Wire (Zinc-coated).** Wire used for bracing shall be smooth galvanized wire, and shall meet AASHTO M 181, Tension Wire, except it may be 9-gage thickness.

160-2.2 GATES AND HARDWARE. Gate frames shall be constructed of hot-dip galvanized steel tubing conforming to AASHTO M 181, Type 1, Grade 1 or Grade 2, and shall be the size shown on the Plans. Heavily galvanized hinges and latches for wood posts shall be furnished with each gate. Either a bolt or lag screw hinge shall be used, and either a wing or butterfly latch shall be furnished.

160-2.3 POSTS.

- a. **Species.** All posts shall be one of the following species of wood, unless otherwise specified.

Group I	Group II
Cedar	Douglas-Fir
Chestnut	Gum, Red
Cypress, Southern	Larch, Western
Locust, Black	Pine, Southern Yellow
Osage-orange	Pine, Lodgepole
Redwood	Tamarack
Yew, Pacific	Ash
Honey locust	Maple, Sugar
Oak, White	Oak, Red
Mulberry	Spruce
Live Oak	

- b. **Quality.** Posts shall be peeled, sound, straight-grained, and free from decay, cracks, and splits; shakes shall not be in excess of 1/4 inch wide and 3 feet long. Checks (lengthwise separations of the wood in a generally radial direction) are permitted, provided they are not harmful.
- c. **Dimensions.** All posts shall be of the length shown on the Plans. Posts shall have the minimum top diameters shown on the Plans or as specified. Sawn and split posts are acceptable instead of round posts if the required diameter round post could be turned from the sawn or split posts.

- d. **Manufacture.** Outer bark shall be completely removed from all posts including depressions. Inner bark shall be removed from all post surfaces to be treated, except inner bark may remain in depressions. The amount of wood shaved off in the removal of inner bark shall be held to a minimum.
- e. **Treatment.** Apply preservative to all timber posts. Use the preservatives and treatment processes of AASHTO M133 and Best Management Practices for the Use of Treated Wood in Aquatic Environments (BMPs), published by the Western Wood Preservers Institute, 12503 SE Mill Plain Blvd, #205 Vancouver, WA 98684 (Phone 360-693-9958). Products shall be treated according AWWPA Standard U1, Commodity Specification A: Sawn Products.

160-2.4 BRACES. Cleats, gate stops, and braces shall be of the size shown on the Plans. They shall be of the same species and quality specified for the posts or approved by the Engineer, and they shall be free from knots larger than one-third the width of the piece. Gate stops shall be made of posts of suitable length. Braces may be made of posts of suitable length or of sawed lumber. All cleats, gate stops, and any braces in contact with the ground and for a distance of at least 6 inches above the ground shall be treated by the hot and cold bath process, specified herein for posts. The wire used in cable for bracing shall conform to paragraph 160-2.1e.

160-2.5 STAPLES. The staples shall be No. 9 galvanized steel wire, 1 inch long for hardwood posts and 1-1/2 inches long for use in softwood posts.

160-2.6 GATE LOCKS. Gate locks shall be provided for each gate and shall be brass, restricted keyway padlocks with a shackle that is 3/8 inch in diameter having a closed clearance of 2-1/4 inches. The locks shall have control key removable cores and each lock shall have a separate replacement core. All cores shall be keyed differently. The Contractor shall provide 4 keys per lock and 2 core removal keys.

CONSTRUCTION METHODS

160-3.1 GENERAL. The fence shall be constructed according to the details on the Plans and as specified herein. The Contractor shall be responsible for establishing the fence alignment as shown on the Plans. After the fence line has been staked and prior to fence installation, the Contractor shall review the alignment with the Engineer and make required adjustments to avoid conflicts.

When directed, the Contractor shall span the opening below the fence with barbed wire at all locations where it is not practical to conform the fence to the general contour of the ground surface because of natural or manmade features such as drainage ditches. The new fence shall be permanently tied to the terminals of existing fences whenever required by the Engineer. The finished fence shall be plumb, taut, true to line and ground contour, and complete in every detail. When directed by the Engineer, the Contractor shall stake down the woven wire fence at several points between posts.

The Contractor shall arrange the work so construction of the new fence immediately follows the removal of existing fences. The length of unfenced section at any time shall not exceed 300 feet. The work shall progress in this manner, and at the close of the working day, the newly constructed fence shall be tied to the unremoved existing fence.

160-3.2 CLEARING FENCE LINE. The site of the fence shall be sufficiently clear of obstructions, and surface irregularities shall be graded so that the fence will conform to the general contour of the ground. The fence line shall be cleared to a minimum width of 10 feet on each side of the centerline of the fence. This clearing shall consist of the removal of all stumps, brush, rocks, trees, or other obstructions that will interfere with proper construction of the fence. Stumps within the cleared area of the fence line shall be grubbed or excavated. The bottom of the fence shall be placed a uniform distance above ground as specified in the Plans. When shown on the Plans, existing fences which interfere with, the new fence location shall be removed by the Contractor as part of the construction work, unless such removal is listed as a separate item in the bid schedule. All holes remaining after post and stump removal shall be refilled with suitable soil, gravel, or other suitable material and shall be compacted with tampers.

160-3.3 SETTING POSTS. Posts shall be set with large ends down, plumb, and in a straight line on the side on which the wire is to be fastened. Posts shall be set full depth and shall not be cut off to eliminate rock or other excavation. Where rock is encountered, it shall be removed to provide full-depth and full-size holes. The bottoms of all posts shall be cut off square. The diameter of the holes shall be at least 6 inches larger than the diameter of the posts. When cleats are used on posts, the holes shall be dug large enough to accommodate them. After posts are placed and lined, the holes shall be backfilled with suitable material that shall be properly compacted by the use of tampers. The posts adjacent to end, corner, anchor, and gate posts shall be set and braced with braces and wire, as shown on the Plans.

160-3.4 ANCHORING. Corner, end, gate, and adjacent intermediate posts shall be anchored, by gaining and spiking cleats to the sides of the posts, as indicated on the Plans. No cleats will be required on other intermediate posts or on anchor posts.

160-3.5 BRACING. End, corner, anchor, and gate posts shall be braced by using a post of sufficient length or a piece of sawed lumber of the proper size, together with a wire cable. The wooden brace shall be gained and securely spiked into the end, corner, anchor, or gate posts and into the next intermediate posts about 6 inches from the top of the respective posts. A cable made of a double strand of galvanized soft wire shall be looped around the end, corner, anchor, or gate post near the ground and around the next intermediate post about 12 inches from the top. After the cable has been stapled in this position, it shall be twisted until tight. The staples used to hold the cable shall be not less than 1-1/2 inches long. The tool used for twisting the cable shall be left in place to permit later adjustment of bracing if found necessary. Anchor posts shall be set at approximately 500-foot intervals and braced to the adjacent posts. Posts shall be braced before the wire fencing is placed.

160-3.6 INSTALLING WIRE. The wires shall be placed on the side of the posts away from the airport or as directed. The wire fence shall be placed on the posts at the height indicated on the Plans. Longitudinal wires shall be installed parallel and drawn uniformly taut. The vertical stay wires of the woven wire fencing shall be straight and vertical. At end and gate posts the woven wire and barbed wire shall be wrapped once around the post; each longitudinal wire shall be stapled at least three times and the ends of these wires shall be tied with a snug, tight twist. Each longitudinal wire shall be stapled to each intermediate post with one steel wire staple; at the corner and anchor posts, two or more staples shall be used. The top strand of barbed wire of all fences shall be stapled with two staples in each post. All staples shall be set diagonally with the grain of the wood and driven up tight. After the fence has been erected, the tops of the wood posts shall be sawed off with a 1-to-3 pitch. The bottom wire of the wire fencing shall clear the ground by not more than 4 inches or less than 1 inch at any place.

160-3.7 SPLICING WIRE. Wire splices in longitudinal wires will be permitted if made with an approved galvanized bolt-clamp splice or a wire splice made as follows: The end of the wires shall be carried 3 inches past the splice tool and wrapped around the other wire away from the tool for at least 6 turns in opposite directions. After the tool is removed, the space occupied by it shall be closed by pulling the ends together. The unused ends of the wires shall be cut off neatly. Woven wire shall be spliced only at posts.

160-3.8 INSTALLING GATES. The gates shall be hung on gate fittings, as shown on the Plans. Fittings on the gate posts shall be clamped, screwed, or bolted to prevent slipping. Gates shall be so erected as to swing in the direction indicated and shall be provided with gate stops, as specified or as shown on the Plans. Gates shall be erected locations shown on the Plans.

160-3.9 EXISTING FENCE CONNECTIONS. Wherever the new fence joins an existing fence, either at a corner or at the intersection of straight fence lines, a corner or anchor post shall be set at the junction and braced and anchored the same as herein described for corner posts.

If the connection is made at other than the corner of the new fence, the last span of the old fence shall contain a brace span.

160-3.10 CLEANING UP. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc., used during construction.

METHOD OF MEASUREMENT

160-4.1 Fences will be measured in place from outside to outside of end posts or corner posts and will be the length of fence actually constructed, except for the space occupied by the gates.

160-4.2 Gates will be measured in units for each gate installed and accepted.

BASIS OF PAYMENT

160-5.1 Payment will be made at the contract unit price per linear foot for fence and per each for gates.

Work involved in clearing and disposal of material along the fence line and any required rock excavation are subsidiary.

Payment will be made under:

Item F160.010.0010	Fence, Class A – per linear foot
Item F160.020.0020	Fence, Class B – per linear foot
Item F160.030.0003	Gates, 3-feet Wide – per each
Item F160.040.0003	Walkway Gates, 3-feet Wide – per each

MATERIAL REQUIREMENTS

AASHTO M 279	Metallic-Coated, Steel Woven Wire Fence Fabric
AASHTO M 280	Metallic-Coated (Carbon) Steel Barbed Wire
AASHTO M 181	Chain-Link Fence
Fed. Spec. TT-W-571	Wood Preservation: Testing Practices

ITEM F-161 WIRE FENCE WITH STEEL POSTS (CLASS C AND D FENCE)

DESCRIPTION

161-1.1 This item covers the requirements for furnishing materials and constructing wire fences and gates with steel posts according to the details included herein and as shown on the Plans. The class of fence to be erected shall be either Class C, woven wire fencing surmounted by 2 strands of barbed wire, or Class D, 4 strands of barbed wire, as specified.

MATERIALS

161-2.1 WIRE.

- a. **Woven Wire (Zinc-coated).** Woven wire fabric shall meet AASHTO M 279, Design Number 726-6-12 ½, Grade 60, Coating Type Z, and Coating Class 3.
- b. **Barbed Wire (Zinc-coated).** Barbed wire shall meet AASHTO M 280, Design Number 12-4-5-14R, Standard Grade, Coating Type Z, and Coating Class 3.
- c. **Barbed Wire (Aluminum-coated).** Barbed wire shall meet AASHTO M 280, Design Number 12-4-5-14R, Standard Grade, Coating Type ZA, and Coating Class 60.
- d. **Bracing Wire (Zinc-coated).** Wire used for bracing shall be smooth galvanized wire, and shall meet AASHTO M 181, Tension Wire, except it may be 9-gage thickness.

161-2.2 FENCE POSTS, GATES, RAILS, BRACES, AND ACCESSORIES. These items shall be hot-dip galvanized steel, conforming to AASHTO M 181, Type 1, Grade 1 or Grade 2, and shall be the size shown on the Plans.

161-2.3 CONCRETE. Concrete shall be of a commercial grade with a minimum 28-day compressive strength of 2,500 pounds per square inch (psi) or an approved, pre-mixed, sacked concrete.

161-2.4 GATE LOCKS. Gate locks shall be provided for each gate and shall be brass, restricted-keyway padlocks with a shackle that is 3/8 inch in diameter having a closed clearance of 2-1/4 inches. The locks shall have control key removable cores and each lock shall have a separate replacement core. All cores shall be keyed differently. The Contractor shall provide 4 keys per lock and 2 core removal keys.

CONSTRUCTION METHODS

161-3.1 GENERAL. The fence shall be constructed according to the details on the Plans and as specified herein. The Contractor shall be responsible for establishing the fence alignment as shown on the Plans. After the fence line has been staked, and prior to fence installation, the Contractor shall review the alignment with the Engineer and make required adjustments to avoid conflicts.

When directed, the Contractor shall span the opening below the fence with barbed wire at all locations where it is not practical to conform the fence to the general contour of the ground surface because of natural or manmade features such as drainage ditches. The new fence shall be permanently tied to the terminals of existing fences whenever required by the Engineer. The finished fence shall be plumb, taut, true to line and ground contour, and complete in every detail. When directed, the Contractor shall stake down the woven wire fence at several points between posts.

When directed, in order to keep stock on adjoining property enclosed at all times, the Contractor shall arrange the work so that construction of the new fence will immediately follow the removal of existing fences. The length of unfenced section at any time shall not exceed 300 feet or such length that the stock can be kept in the proper field. The work shall progress in this manner and at the close of the working day the newly constructed fence shall be tied to the existing fence. Any openings in the fence shall be guarded when stock is using the adjoining property.

161-3.2 CLEARING FENCE LINE. The site of the fence shall be sufficiently cleared of obstructions, and surface irregularities. The fence line shall be graded so that the fence will conform to the general contour of the ground. The fence line shall be cleared to a minimum width of 10 feet on each side of the centerline of the fence. This clearing shall consist of the removal of all stumps, brush, rocks, trees, or other obstructions which will interfere with proper construction of the fence. Stumps within the cleared area of the fence shall be grubbed or excavated. The bottom of the fence shall be placed a uniform distance above ground, as specified in the Plans. When shown on the Plans or as directed by the Engineer, the existing fences which interfere with, the new fence location shall be removed by the Contractor as a part of the construction work unless such removal is listed as a separate item in the bid schedule. All holes remaining after post and stump removal shall be refilled with suitable soil, gravel, or other suitable material and compacted with tampers.

161-3.3 INSTALLING POSTS. All posts shall be spaced as shown on the Plans. Corner, brace, anchor, end, and gate posts shall be set in concrete bases as shown on the Plans. The top of the concrete shall be slightly above the ground surface, trowel finished, and sloped to drain. Post holes of full depth and size for the concrete shall be provided. All line posts may be either driven or set in dug holes to a penetration of 3 feet. All post setting shall be done carefully and to true alignment. Dirt removed for placing posts, anchor bars, flanges, etc., shall be replaced, tamped, and leveled. When posts are driven, care shall be exercised to prevent marring or buckling of the posts. Damaged posts shall be replaced at the Contractor's expense.

161-3.4 BRACING. All corner, anchor, end, and gate posts shall be braced as shown on the Plans. Anchor posts shall be set at approximately 500-foot intervals and braced to the adjacent posts.

161-3.5 INSTALLING WIRE. All barbed wire and woven wire shall be placed on the side of the post away from the airport, or as directed by the Engineer, at the height indicated on the Plans. The woven wire shall be carefully stretched and hung without sag and with true alignment. Care shall be taken not to stretch the wire so tightly that it will break in cold weather or pull up corner and brace posts. All horizontal wires shall be fastened securely to each post by fasteners or clips designed for use with the posts furnished. The woven wire shall be wrapped around end, corner, and gate posts, and the ends of all horizontal wires shall be tied with snug, tight twists. The wire shall be secured to prevent slipping up and down the post. Barbed wire strands shall be stretched and each strand secured to each post to prevent slipping out of line or becoming loose. At end, corner, and gate posts the barbed wire shall be securely wrapped and anchored once about the post from outside and secured against slipping by tying the ends with snug, tight twists. However, on spans of less than 100 feet, both ends of the span need not be wrapped around the posts. The bottom wire of the woven wire fencing shall clear the ground by not more than 4 inches or less than 1 inch at any place.

161-3.6 SPLICING WIRE. Splices in barbed and woven wire will be permitted if made with an approved galvanized bolt-clamp splice or a wire splice made as follows: The ends of each wire shall be carried 3 inches past the splice tool and wrapped around the other wire for at least 6 turns in opposite directions. After the tool is removed, the space occupied by it shall be closed by pulling the ends together. The unused ends of the wire shall be cut off neatly.

161-3.7 INSTALLING GATES. The gates shall be hung on gate fittings as shown on the Plans. They shall be attached in such a manner that the gate cannot be lifted off the hinges. Gates shall be erected to swing in the direction indicated and shall be provided with gate stops, as specified or as shown on the Plans. Gates shall be erected at locations shown on the Plans.

161-3.8 EXISTING FENCE CONNECTIONS. Wherever the new fence joins an existing fence, either at a corner or at the intersection of straight fence lines, a corner or anchor post shall be set at the junction and braced and anchored the same as herein described for corner posts.

If the connection is made at other than the corner of the new fence, the last span of the old fence shall contain a brace span.

161-3.9 CLEANING UP. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc. used during construction.

METHOD OF MEASUREMENT

161-4.1 Fences, Class C (Steel Posts), or Class D (Steel Posts), shall be measured in place from outside to outside of end posts or corner posts and shall be the length of fence actually constructed, except for the space occupied by the gates.

161-4.2 Vehicle gates and pedestrian gates will be measured in units for each gate installed and accepted.

BASIS OF PAYMENT

161-5.1 Payment will be made at the contract unit price per linear foot for fence and per each for gates.

Work involved in clearing and disposal of material along the fence line and any required rock excavation are subsidiary.

Payment will be made under:

Item F161.010.0010	Fence, Class C – per linear foot
Item F161.020.0020	Fence, Class D – per linear foot
Item F161.030.0003	Gates, 3-feet Wide – per each
Item F161.040.0003	Walkway Gates, 3-feet Wide – per each

MATERIAL REQUIREMENTS

AASHTO M 279	Metallic-Coated, Steel Woven Wire Fence Fabric
AASHTO M 280	Metallic-Coated (Carbon) Steel Barbed Wire
AASHTO M 181	Chain-Link Fence

ITEM F-162 CHAIN-LINK FENCE

DESCRIPTION

162-1.1 This item shall consist of furnishing and erecting a chain-link fence according to these specifications and the details shown on the Plans.

MATERIALS

162-2.1 FABRIC. Chain-link fabric shall meet AASHTO M 181, 9-gage thickness, Type I (zinc-coated steel), Class D coating, and 2-inch mesh.

162-2.2 BARBED WIRE. Barbed wire shall meet AASHTO M 280, Design Number 12-4-5-14R, Standard Grade, Coating Type Z, and Coating Class 3.

162-2.3 POSTS, RAILS AND BRACES. Line posts, rails, and braces shall be galvanized steel pipe, or equivalent galvanized roll-formed sections, and meet AASHTO M 181, Type I, Grade 1 or Grade 2.

The dimensions of the posts, rails, and braces shall be as shown on the Plans.

162-2.4 GATES. Gate frames shall consist of galvanized steel pipe, or equivalent galvanized roll-formed sections, and shall meet AASHTO M 181, Type I, Grade 1 or Grade 2. The fabric shall be of the same type material as used in the fence.

162-2.5 WIRE TIES AND TENSION WIRES. Wire ties for use in conjunction with a given type of fabric shall be of the same material and coating weight identified with the fabric type. Tension wire shall meet AASHTO M 181, Type I, Class 3 coating.

162-2.6 MISCELLANEOUS FITTINGS AND HARDWARE. Miscellaneous steel fittings and hardware shall meet AASHTO M 181, Type I, Grade 1 Barbed wire support arms shall withstand a load of 250 pounds applied vertically to the outermost end of the arm.

162-2.7 CONCRETE. Concrete shall be of a commercial grade with a minimum 28-day compressive strength of 2,500 pounds per square inch (psi) or an approved, pre-mixed, sacked concrete.

162-2.8 MARKING. Each roll of fabric shall carry a tag showing the kind of base metal, kind of coating, the gage of the wire, the length of fencing in the roll, and the name of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal, and kind of coating.

162-2.9 GATE LOCKS. Gate locks shall be provided for each gate and shall be brass, restricted keyway padlocks with a shackle that is 3/8 inch in diameter having a closed clearance of 2-1/4 inches. The locks shall have control key removable cores and each lock shall have a separate replacement core. All cores shall be keyed differently. The Contractor shall provide 4 keys per lock, and 2 core-removal keys.

162-2.10 KEYLESS LOCKS. When specified, a changeable combination lock shall be furnished with pedestrian gates. The keyless lock shall have a 4- or 5-digit mechanism and shall be an Ilco Unican Model 1011 or approved equal. A sign, 12 inches by 12 inches, shall be securely mounted on the inside of the gate. The sign shall be shielded from view from outside of the gate by means of a hinged 12-inch by 12-inch cover or other means approved by the Engineer. The cover shall have the legend "LIFT AND RECORD COMBINATION FOR REENTRY". The sign shall be aluminum sheet with white reflective coating. Letters shall be black and a minimum of 3/4 inch tall.

CONSTRUCTION METHODS

162-3.1 GENERAL. The fence shall be constructed according to the details on the Plans and as specified herein using new materials. The Contractor shall be responsible for establishing the fence alignment as shown on the Plans. After the fence line has been staked and prior to fence installation, the Contractor shall review the alignment with the Engineer and make required adjustments to avoid conflicts.

The Contractor shall arrange the work so that construction of the new fence will immediately follow the removal of existing fences. The length of unfenced section at any time shall not exceed 300 feet or such length that the stock can be kept in the proper field. The work shall progress in this manner and at the close of the working day the newly constructed fence shall be tied to the existing fence.

162-3.2 CLEARING FENCE LINE. All trees, brush, stumps, logs, and other debris which would interfere with the proper construction of the fence in the required location shall be removed a minimum width of 10 feet on each side of the fence centerline before starting fencing operations.

162-3.3 INSTALLING POSTS. All end posts, corner posts and pull posts shall be set in concrete at the required dimensions and depths and at the spacing shown on the Plans. Line posts may be either set in concrete as shown on the Plans or driven a minimum of 5 feet embedment. Pull posts shall have a maximum spacing of 250 feet.

Posts shall be spaced as shown on the Plans but in no case shall spacing be more than 10 feet. The post holes shall be in proper alignment so that there is a minimum of 3 inches of concrete on all sides of the posts. The concrete shall be thoroughly compacted around the posts by tamping or vibrating and shall have a smooth finish slightly higher than the ground and sloped to drain away from the posts. All posts shall be set plumb and to the required grade and alignment. No materials shall be installed on the posts, nor shall the posts be disturbed in any manner within 7 days after the individual post footing is completed.

Should rock be encountered at a depth less than the planned embedment depth, a hole 2 inches larger than the greatest dimension of the posts shall be drilled to a depth of 12 inches. After the posts are set, the remainder of the drilled hole shall be filled with grout, composed of one part Portland cement and two parts mortar sand. Any remaining space above the rock shall be filled with concrete in the manner described above.

In lieu of drilling, the rock may be excavated to the required embedment depth.

162-3.4 INSTALLING TOP RAILS. The top rail shall be continuous and shall pass through the post tops. The coupling used to join the top rail lengths shall allow for expansion.

162-3.5 INSTALLING BRACES. Horizontal brace rails, with diagonal truss rods and turnbuckles, shall be installed at all terminal posts.

162-3.6 INSTALLING FABRIC. The wire fabric shall be firmly attached to the posts and braced in the manner shown on the Plans. All wire shall be stretched taut and shall be installed to the required elevations. The fence shall generally follow the contour of the ground, with the bottom of the fence fabric no less than 1 inch or more than 4 inches from the ground surface. Grading shall be performed where necessary to provide a neat appearance.

At locations of small natural swales or drainage ditches and where it is not practical to have the fence conform to the general contour of the ground surface, longer posts may be used and multiple strands of barbed wire stretched thereon to span the opening below the fence. The vertical clearance between strands of barbed wire shall be 6 inches or less.

162-3.7 ELECTRICAL GROUNDS. Electrical grounds shall be installed along the fence between gate openings and at intervals not exceeding 500 feet. Electrical grounds shall also be installed where a power line passes over the fence. The ground shall be accomplished with a copper clad rod 8 feet long and a minimum of 5/8 inch diameter driven vertically until the top is 6 inches below the ground surface. A No. 6 solid copper conductor shall be clamped to the rod and to the fence in such a manner that each element of the fence is grounded. The Contractor shall comply with FAA-STD-019, Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment, Paragraph 4.2.3.8, Lightning Protection for Fences and Gates, when fencing is adjacent to FAA facilities.

162-3.8 CLEANING UP. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc., used during construction.

METHOD OF MEASUREMENT

162-4.1 Chain-link fence will be measured along the top of the fence from center to center of end posts, excluding the length occupied by gate openings.

162-4.2 Gates will be measured as complete units.

BASIS OF PAYMENT

162-5.1 Payment will be made at the contract unit price per linear foot for fence and per each for gates.

Work and materials involved in clearing and disposal of material along the fence line, rock excavation, and ground rod installation are subsidiary.

Payment will be made under:

Item F162.010.0008	8-foot Chain-Link Fence – per linear foot
Item F162.030.0004	Single Swing Gate, 4-feet Wide – per each
Item F162.040.0020	Double Swing Gate, 20-feet Wide – per each
Item F162.050.0018	Single Cantilever Gate, 18-feet Wide – per each

MATERIAL REQUIREMENTS

AASHTO M 181	Chain-Link Fence
AASHTO M 280	Metallic-Coated (Carbon) Steel Barbed Wire
ASTM A121	Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A123	Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A392	Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A491	Aluminum-Coated Steel Chain-Link Fence Fabric
ASTM A572	High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A653	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A824	Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link Fence
ASTM A1011	Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low Alloy with Improved Formability, and Ultra High Strength
ASTM B117	Operating Salt Spray (Fog) Apparatus
ASTM B221	Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes
ASTM B429	Aluminum-Alloy Extruded Structural Pipe and Tube
ASTM F668	Polyvinyl Chloride(PVC) and Other Organic Polymer Coated Steel Chain-Link Fence Fabric
ASTM F1043	Strength and Protective Coatings on Steel Industrial Fence Framework
ASTM F1083	Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
ASTM F1183	Aluminum Alloy Chain Link Fence Fabric

ASTM F1345	Zinc 5% Aluminum-Mischmetal Alloy Coated Steel Chain-Link Fence Fabric
ASTM G152	Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G154	Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
ASTM G155	Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials
FAA-STD-019	Lighting and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment

ITEM F-170 STEEL BOLLARD

DESCRIPTION

170-1.1 This item consists of replacing and/or installing new steel bollards as shown on the plans or as directed by the Engineer.

MATERIALS

170-2.1 Use materials that conform to the following:

- a. **Steel Pipe.** Use standard weight, Grade B, galvanized, welded, or seamless pipe meeting ASTM A53.
- b. **Concrete.** Use commercial grade concrete with a minimum 28-day compressive strength of 2,500 pounds per square inch (psi) or an approved, pre-mixed, sacked concrete.
- c. **Paint.** Use single component, moisture cure, polyurethane (SC-MC-U) zinc primer. Use single component, moisture cure, aliphatic polyurethane (SC-MC-ALIP-U) safety yellow paint for the top coats.
- d. **Retroreflective Bands.** Use flexible high intensity sheeting, pressure sensitive type, cut to form 6-inch wide reflector bands meeting AASTM D4956, Type III-A. Use sheeting with a smooth sealed outer surface.

CONSTRUCTION REQUIREMENTS

170-3.1 Install bollards plumb, in hand or mechanically dug holes, backfilled with the specified material, and thoroughly compacted to the satisfaction of the Engineer.

170-3.2 PAINTING. Paint bollards with one coat of primer and two top coats of safety yellow. Ensure that the surfaces are free of all oil, grease, dirt, abrasive residues, and all other foreign substances prior to application of coatings. Maintain the surface to be coated at a minimum temperature of 5 °F above the dew point for the duration of coating application. Adhere to these preparation requirements in addition to any requirements by the coating manufacturer. Repair any nicks, scratches or other paint damage resulting from shipping and handling at the site.

170-3.3 REFLECTIVE BANDS. Apply a minimum of two white retroreflective bands placed 3-4 inches from the top with a maximum of 6 inches between the bands.

METHOD OF MEASUREMENT

170-4.1

- a. **Lump Sum.** No measurement of quantities will be made.
- b. **Unit Prices.** By the number of bollards specified, installed and accepted as completed units in place. Where replacement is specified, each unit shall include removal and installation.

BASIS OF PAYMENT

170-5.1 Payment will include all labor, equipment, materials, and personnel to complete the work described in the plans.

Payment will be made under:

Item F170.010.0000	Steel Bollard – per each
Item F170.020.0000	Steel Bollards – per lump sum

ITEM F-171 POWER GATE OPERATORS

DESCRIPTION

171-1.1 Provide a complete and operational power gate operating system, with controls, designed and manufactured to operate as an integral system with the cantilever gate as located and shown on the plans.

MATERIALS

171-2.1 APPROVALS. Obtain approval of all materials or equipment proposed to use or incorporate in the work. Submit to the Engineer five (5) complete listings of materials and equipment specified herein and on the plans. Prepare the list to clearly identify the material or equipment by item, name, or designation used and indicate where specified. Provide submittals neatly bound, clearly indexed, and include applicable catalog numbers, cuts, wiring diagrams, performance data, operation and maintenance manuals, etc., for all material or equipment specified. In addition, whenever called for elsewhere in these Specifications include in the submittal certificates of compliance, manufacturer's instructions and/or shop drawings, or proposed construction or installation procedures.

171-2.2 COMPONENTS. Provide major components to include a new load center, gate operator, radio control and keypad system, cable, conduit, circuit breakers, and connectors. Provide NEMA approved electrical components. Provide testing of the gate operators and control systems before shipment from the factory.

- a. **Gate Operator.** 1 horsepower minimum, 240 Volts (V), single phase, capable of instant reversing, and adjustable time delay relay from 1/2 to 180 seconds for closing, UL 325 listed, mechanical braking within NEMA 3R enclosure. Chamberlain Group, Inc. Model SL595 Heavy Duty, Harsh Environment, or approved equal.
- b. **Key-Pad System.** Provide complete keypad systems designed to be impervious to the local environmental conditions. Install at each automated gate. Include any required power supplies and interfaces for a self-contained remote unit capable of handling at least two keypads.

Provide for each gate, 2 each keypads and terminal or interface to be controlled by either the radio or keypad systems. Digital Key Model 1050 Industrial Access or approved equal.

Include time delay relays, adjustable from 1/2 to 180 seconds for each system.

- c. **Radio-Control System.** Provide complete radio-control system. Include any required power supplies and interfaces for self-contained remote units.

Provide radio-receiver system designed to be impervious to local environmental conditions.

Provide system that interfaces with the keypad system and designed to be controlled by either method.

Provide for each gate operator, 12 each adjustable frequency transmitters, Pulsar Control or approved equal.

- d. **Load Center.** Provide enclosure for housing equipment, NEMA 12 lockable type, including an interior panel. Minimum size 36 inches x 24 inches x 10 inches. Hoffman or approved equal. Provide enclosure sized large enough to house panel, radio, keypad interface, power supply, and relays. Size distribution center to accommodate the equipment indicated in the load center wiring diagram on the plans.

Provide panel board rated as shown on the plans, single phase, 3- wire, and sized to provide all circuits and spares indicated. Provide branch breakers of bolt in type. Install panel board in the enclosure.

- e. Conductors for secondary systems in conduits. Provide copper, 600 volt-Volt Type XHHW, (X = Cross-Linked Polyethylene, HH = High Heat-Resistance, W = Water Resistance, Temperature Rating: 194° F in dry locations and 167° F in wet locations), black (phase conductors) and, white or yellow (neutral), and green (equipment grounding conductor).
- f. **Rigid steel conduit.** Provide standard weight (schedule 40) steel pipe, galvanized on the outside and finished with 40 mil (thousandth of an inch) Polyvinyl Chloride (PVC) exterior coating and with interior finished with a coating of urethane, Robroy Industries or approved equal. Provide fittings that meet the same specifications as the conduit.
- g. **Flexible metal conduit.** Provide liquid tight Anaconda Type 'EF' or approved equal.
- h. **Marker tape.** Provide yellow polyethylene plastic, printed "Caution Buried Electric Line Below", Allen System or approved equal.
- i. **Tapes.**
 - (1) Pipe Sealing Tape: Scotch No. 48, Teflon pipe sealing tape or approved equal.
 - (2) Corrosion Preventive Tape: Scotch No. 43 or approved equal.
 - (3) Electrical Insulating Tape: Scotch No. 88 or approved equal.
- j. **Ground conductor.** Provide stranded bare copper, No. 6 AWG.
- k. **Ground rods.** Provide 3/4-inch diameter by 10 feet length copper clad steel.
- l. **Concrete.** Provide commercial grade concrete with a minimum 28-day compressive strength of 2,500 psi or an approved, pre-mixed, sacked concrete.
- m. **Trench Backfill.** Use material of the type shown on the plans.

CONSTRUCTION REQUIREMENTS

171-3.1 GENERAL. Install gate operator and control systems as shown on the plans and in accordance with the manufacturer's instructions. Perform work in conformance with applicable National Fire Protection Association (NFPA) codes and standards, including NFPA 70 National Electrical Code (NEC), and all State and local codes. Locate new gate operators, fixtures, conduit, cables, etc., as shown on the plans and/or as directed by the Engineer.

171-3.2 TRENCHING, EXCAVATION, AND BACKFILLING.

- a. **Trenching and Excavation.** Trenches or excavations may be excavated manually or with mechanical equipment of standard manufacture specifically designed for excavating or trenching. Do not use blades of road patrols or graders to excavate the trenches.

Ensure that excavations for the placement or construction of items associated with the electrical work are of sufficient size to permit the placement or construction of the full width, length, and depth of the structure or object and the layer of bedding material, whenever bedding is required. Such items include, but are not limited to, foundations, footings, slabs, pads, manholes, handholes, ducts and/or duct banks, light base assemblies or outing stakes. Use the specified backfill material as shown on the plans.

Excavate the walls of trenches as near vertical as practical with smooth bottom, and free of frost susceptible material, pools of water, trash or debris. Control drainage in the vicinity of the trenches to prevent the runoff of surface water in the trenches. Promptly pump to remove any water accumulated in the trenches.

Provide trenches for burial of cable or conduit of sufficient width to provide a minimum 3 inches of lateral clearance between the conduit and trench walls on both sides or provide the lateral clearance as shown on the plans. Provide sufficient depth so that the top of the cable or conduit is a minimum of 18 inches below finish grade or to the depth indicated on the plans, when installed; and graded to slope as required.

Before placing any conduit in the trenches, remove all rocks or stones larger than 2 inches in diameter from the bottom of the trench. Tamp the trench bottom by filling or cutting away as required, to provide uniform conduit grades, sloping towards outlets, as shown on the plans. Call for inspection of the trenches by the Engineer before placing conduit.

- b. Backfilling.** Before backfilling, cover the conduit with a 3 to 6 inch layer of approved backfill or bedding material as shown on the plans. Begin backfilling of the trenches after the conduit is installed and inspected and approved for backfilling by the Engineer. Thoroughly tamp the initial cover layer. Backfill the remainder of the trench with approved materials as shown on the plans, placed in 6-inch layers. Compact each layer to the density of the adjacent undisturbed ground and/or to the satisfaction of the Engineer. Backfill completely to the level of the adjacent surface. For trenches and excavations in areas where a surface layer of gravel, rock, or other material differing from subgrade has previously been placed, fill the upper part of the trench with the same material salvaged from the excavating or scripted from the adjoining surface. Provide at least 6 inches of surfacing material in the trench. For trenches in existing asphalt concrete, resurface the trench with a minimum 3-inch depth of an approved, pre-mixed, sacked concrete.

Restore all surface areas disturbed and/or damaged by trenching, excavation, sorting of materials, or any other construction related activities to their original condition except as stated above. Replace surfacing or cover material with new material of the same type of material removed. Accomplish restoration and/or removal and replacement of surfacing as required under this item at no additional cost to the State.

171-3.3 GROUNDING. Install grounding electrodes and grounding conductors as shown on the plans.

171-3.4 TESTING. Furnish all necessary labor, materials, equipment, appliances and power for conducting and performing tests of materials, equipment and/or systems. Begin tests after the work has been inspected and approved by the Engineer. Tabulate, sign, and date all test results on reproducible test sheets. No work will be accepted until all the applicable tests are performed successfully with satisfactory results and test sheets delivered to the Engineer.

Repair and/or remove and replace materials, equipment and/or systems that do not test satisfactorily.

Retest after repair or replacement.

Test and demonstrate to the Engineer the following:

- a.** Circuits are properly connected in accordance with applicable wiring diagrams.
- b.** Power and control circuits are continuous and free from short circuits.
- c.** Circuits are free from unspecified grounds.
- d.** Resistance to ground of all ungrounded 600-Volt multiple circuit conductors is not less than ten megohms when tested with a 1,000-Volt insulation resistance tester.
- e.** Circuits are operable. Demonstration to include operation of each control and switch 10 times.

171-3.5 INSPECTION. Notify the Engineer and request inspection at least 48 hours prior to installing cables, conduit, concrete or lighting fixtures, making any splices, or covering any buried or concealed work. Immediately correct any deficiencies found during the inspection.

171-3.6 RECORD DOCUMENTS. Maintain at the project site a complete set of contract plans, Specifications, and approved changes to the contract documents. In addition to the above, maintain a separate complete set of electrical drawings for as-built purposes. Note all changes upon these as-builts along with the date and authority approving the change.

On the as-built drawings, show locations of all items such as lights, conduit, handholes, etc., including any existing active lines encountered. Show dimensions from roadway and taxiway centerlines or other permanent objects. Include complete wiring diagrams, (both power and control), identifying terminals, cables, and connections.

171-3.7 GUARANTEE. Guarantee that all materials or workmanship found defective within one year of final acceptance will be replaced at the your expense, promptly upon notification and to the satisfaction of the Department.

METHOD OF MEASUREMENT

171-4.1 Measured as a complete unit to include radio and keypad system, gate operator, poles, load center with panel, relays, all wire and conduit, grounding rods, ground conductors, concrete footings, excavation, bedding, backfill, marker tape, concrete bases, all testing and all other incidentals necessary for an approved and operational power gate operator system installation.

BASIS OF PAYMENT

171-5.1 At the contract unit price per each for the completed and accepted system.

Payment will be made under:

Item F171.010.0000	Power Gate Operator System – per each
Item F171.020.0000	Relocate Power Gate Operator System – per lump sum
Item F171.030.0000	CCTV Camera – per each
Item F171.040.0000	PoE Switch – per each

ITEM F-174 SINGLE AND DOUBLE POLE SWING GATE

DESCRIPTION

174-1.1 Furnish and install single or double pole swing gates at the locations and according to the details shown on the plans. Include gate foundations, gate assemblies, installation, application of reflective tape, and all materials and incidentals necessary for complete and operational gates.

MATERIALS

174-2.1 STEEL. Provide structural steel that conforms to the requirements of ASTM A36 (Standard specification for carbon structural steel). Use structural steel galvanized in conformance with ASTM A123 (standard specification for hot dipped galvanized zinc coatings on iron and steel products) 2.0 OZ/SF, or in conformance with ASTM A153 (standard specification for hot dip galvanized zinc coatings on iron and steel hardware) as appropriate. Galvanize gates and gate components after fabrication. Make repairs to damaged galvanizing in conformance with ASTM A780 (standard practice for repair of damaged and undercoated areas of hot dip galvanized coatings). Provide high strength bolt, nut and washer material conforming to the requirements of ASTM A325. Provide galvanized heavy hex-type bolts and nuts if components connected are galvanized. Provide galvanized machine bolts conforming to ASTM A307.

174-2.2 CONCRETE. Provide concrete of a commercial grade with a minimum 28-day compressive strength of 2,500 psi or an approved, pre-mixed, sacked concrete.

174-2.3 LOCKS. Provide brass restricted keyway padlocks for each gate with a shackle that is 3/8-inch in diameter and a closed clearance of 2-1/4 inches. Provide locks with control key removable cores and furnish a separate replacement core for each lock. Provide cores that are keyed differently. Provide 4 keys per lock, and 2 core-removable keys.

174-2.4 REFLECTIVE MARKINGS. High intensity reflective sheeting per ASTM D4956.

CONSTRUCTION REQUIREMENTS

174-3.1 FABRICATION. Give 15 days notice before beginning fabrication work at the shop so that inspection may be provided.

Provide workmanship and finish equal to the best practice in modern fabrication shops. Finish portions of the work exposed to view neatly. Perform shearing, flame cutting, and chipping carefully and accurately. Steel or wrought iron may be flame cut, provided a smooth surface is obtained by the use of a mechanical guide. Perform flame cutting by hand only where approved, and smooth the surface by planing, chipping, or grinding. Adjust and manipulate the cutting flame so as to avoid cutting beyond the prescribed lines. Fillet re-entrant cuts to a radius of not less than 3/4-inch.

Finishing and Shaping: Provide finished members true to line and free from twists, bends, and open joints. Store structural material, either plain or fabricated, at the fabricating shop above the ground on platforms, skids, or other supports. Keep free from dirt, grease, or other foreign matter, and protect from corrosion.

Perform welding in accordance with AWS D1.1.

174-3.2 INSTALLING POSTS. Set all gate posts in concrete at the required dimensions and depths and at the spacing shown on the plans.

Properly align post holes so that there is a minimum of 3 inches of concrete on all sides of the posts. Thoroughly compact concrete around each post by tamping or vibrating and finish to a smooth surface slightly higher than the surrounding ground and sloped to drain away from the posts. Set all posts plumb and to the required grade and alignment. Do not install materials on the posts or disturb the posts within 7 days after completion of the individual post footing.

Should rock be encountered at a depth less than the planned embedment depth, drill a hole 2 inches larger than the greatest dimension of the post and to a depth of 12 inches below the planned embedment depth. After the posts are set, fill the remainder of the drilled hole with grout, composed of one part Portland cement and two parts mortar sand. Fill any remaining space above the rock with concrete in the manner described above. In lieu of drilling, the rock may be excavated to the required embedment depth.

174-3.3 INSTALLING GATES. Install gates level and plumb with the swing as indicated on the plans. Install reflective sheeting on clean, dry surfaces in accordance with the manufacturer's recommendations.

METHOD OF MEASUREMENT

174-4.1 By the number of gates of each type installed and accepted.

BASIS OF PAYMENT

174-5.1 Payment will be made at the contract unit price for each furnished, installed and accepted item.

Payment will be made under:

Item F174.010.0008	Single Pole Swing Gate, 8-feet Wide – per each
Item F174.010.0012	Single Pole Swing Gate, 12-feet Wide – per each
Item F174.020.0008	Double Pole Swing Gate, 8-feet Wide – per each
Item F174.020.0012	Double Pole Swing Gate, 12-feet Wide – per each

ITEM F-175 BLAST FENCE

DESCRIPTION

175-1.1 Fabricate and erect blast fence (jet blast deflector) complete with concrete foundation as shown on the plans.

DESIGN

175-2.1 GENERAL. Provide a 14-foot nominal height, concave, non-perforated, galvanized, corrugated type blast fence with corrugations running in a horizontal direction and with all components designed to meet the material requirements of this specification. Design the fence to be capable of withstanding loadings of 50 PSF or jet blast velocities of at least 140 mph and capable of deflecting the entire blast envelope upwards at a minimum angle of 60 degrees under no wind conditions. Usage criteria are a B 747 series aircraft, taxi and breakaway power, and tail 35 feet or more distant (outboard engine nozzles 144 feet or more distant) from the leading edge of the deflector. Select an experienced manufacturer that has regularly and continuously designed and manufactured jet blast fences for a period of not less than 3 years. Provide Lynnco, Type G-14NB-6 as manufactured by Blast Deflectors, Inc., 5595 Equity Ave., Reno, Nevada, 89502, Telephone: 775/856-1928, or approved equal.

175-2.2 WORKING DRAWINGS, ENGINEERING CALCULATIONS/DESIGN ANALYSIS, AND MANUFACTURER'S CERTIFICATIONS. Submit working drawings in accordance with the general contract requirements. Include installation details and design computations. Indicate identification marks, location of units and the work, elevations, fabrication details, connections, dimensions, interspace with adjacent members anchor bolt layout and special handling instructions to cover manufacture, handling and erection.

Prior to purchasing the blast fence, submit manufacturer's certification and design analysis demonstrating that the blast fence meets the requirements of this specification. Submit design analysis showing load and stresses in structural members, deflecting surface and bolted joints, using the maximum anticipated pressures under the conditions previously stated as the average pressure for load calculations.

Should a type of blast fence other than that noted as standard for this work be used, provide the following information and data. Submit for approval a tabulation of results of full scale instrumented field test witnessed and certified by an accredited testing laboratory. Subject the blast fence to the jet blast conditions previously stated. Show tabulation of the maximum pressure in psi, temperature in degrees F., vibration frequency in CPS, vibration amplitude in inches, taken at the centerline of the blast impingement on deflector. Results of all such readings may not be greater than the reading submitted for the blast deflector fencing listed as the standard for this work, for each corresponding item. Submit results of smoke-pot tests behind the deflector, demonstrating that smoke and gases are deflected in a vertical direction, with no evidence of smoke dispersal behind the deflector. Because of thermal shock and cavitation effects that can cause cracking and spalling, concrete deflectors may not be used as an alternate.

175-2.3 WARRANTY. Prior to purchasing the blast fence, provide a 1-year written guarantee from the manufacturer and the Contractor jointly, warranting the blast fence against any defects in the structural integrity, performance, and installation including but not limited to the structural foundation, the anchor bolts, the steel framing, and the corrugated sheets.

175-2.4 EVIDENCE OF SATISFACTORY OPERATION. Prior to purchasing the blast fence, submit evidence of satisfactory operation for at least 3 years in actual field service for continued testing of similar aircraft and jet engines.

MATERIALS

175-3.1 DEFLECTOR SURFACE. Provide deflecting surface of galvanized corrugated steel with minimum 2 oz. per square foot zinc coating per Fed. Spec. WW-P-00405. Provide sheets with a section modulus of not less than 0.0163 inch cubed per inch. Deflecting surfaces with perforations, holes, or other openings are unacceptable.

175-3.2 FRAMING. Fabricate framing members from ASTM A36 steel hot dipped galvanized after fabrication. Provide structural framing shapes, rolled, punched and prefabricated for bolting together at the site. Hot dip galvanize all structural members, parts, and corrugated metal with a minimum coating of 2.0 oz. zinc per square foot of surface.

175-3.3 CONCRETE. Meet the requirements of item P-610.

175-3.4 ANCHOR BOLTS. Use “L” type hot dipped galvanized anchor bolt assemblies for setting in newly placed concrete, tapped oversize, with a fixed square nut.

175-3.5 ASSEMBLY BOLTS. Provide mechanically galvanized bolts, nuts, and washers except where otherwise specified. Provide bolts and cap screws that meet the requirements of ASTM A449. Use all-steel self-locking nuts except on anchor bolts. Provide heat-treated SAE 1038 steel bolts where subject to blast temperatures.

CONSTRUCTION REQUIREMENTS

175-4.1 CONCRETE FOUNDATION. Install concrete foundations according to the dimensions shown on the plans. Place anchor bolts in accordance with the approved working drawings. Tolerance between anchor bolt centers is non-cumulative and must be accurately held in order to prevent assembly difficulty. Use wooden or steel gig in setting of anchor bolts. Do not set anchor bolts freehand. Run anchor bolt nuts tight on threads to locate the grade line. Ground the blast fence by welding one anchor bolt every 20’ apart to the vertical reinforcing bars in the foundation slab.

175-4.2 BLAST FENCE. Assemble all components by bolting together with flat washers under bolt heads and half oval washers between nuts and corrugated sheets. Welding, brazing or burning of holes is not permitted. Tighten all nuts and bolts to the torque specified by the manufacturer. Tighten all vane bolts against half oval washer until washer snugs to corrugation. Assemble in accordance with manufacturer installation instructions and approved working drawings. Tighten anchor bolts to the manufacturer’s prescribed torque, against an external spline lock washer at final assembly.

175-4.3 FINISH. Painting of galvanized surfaces is not required. White rust or mill markings on galvanized surfaces are not cause for rejection but retouch or regalvanize surfaces showing iron stain, rust, scratches, or marring. Make repairs to damaged galvanizing in conformance with ASTM A780 (standard practice for repair of damaged and undercoated areas of hot dip galvanized coatings) at no additional cost to the Department.

METHOD OF MEASUREMENT

175-5.1 SECTION 90. Measured in place from outside to outside of end posts or corner posts and for the length of blast fence actually constructed.

BASIS OF PAYMENT

175-5.2 At the contract unit price for each furnished, installed, and accepted item. Work and materials associated with construction of the concrete blast fence foundation, excavation, backfill, and grade preparation is subsidiary.

Payment will be made under:

Item F175.010.0000	Blast Fence – per linear foot
Item F175.020.0000	Relocate Blast Fence – per lump sum

ITEM F-180 SCREEN FENCE

DESCRIPTION

180-1.1 Furnish and erect a screen fence as shown on the plans.

MATERIALS

180-2.1 Provide fencing materials as shown on the plans and as follows to include zinc-coated framework, thoroughly color coated with 3-mil minimum polyester layer for protection from corrosion:

Chain-Link Fabric:	
Type:	Polyvinyl chloride extruded over zinc-coated steel wire per ASTM F668 Class 1 or extruded and adhered to zinc-coated steel wire per ASTM F668 Class 2a.
Gauge:	9 gauge galvanized core wire
Mesh:	2 inch
Height:	6 foot
Selvage	Knuckled top and bottom up to 5 feet high, twisted and knuckled 6 feet to 20 feet high, except 1-1/4 inch mesh and smaller knuckled top and bottom.
Colors:	Forest Green
Framework:	
Type 2:	Spectra polyester resin, 3 mils minimum, over galvanized steel ASTM F1043, Group 1C, with a minimum yield strength of 50,000 psi. Protective coating per ASTM F1043, external coating Type B, zinc with organic overcoat, 0.9 ounces per square foot minimum zinc-coated with chromate conversion coating and verifiable polymer film.
Colors:	Forest Green
Top Rail:	
Type 2:	1-5/8 inch O.D. SCH 40 pipe (0.111 inch wall thickness, 1.83 lb./ft.)
Line Posts:	
Type 2:	2-3/8 inch O.D. SCH 40 pipe (0.130 inch wall thickness, 3.12 lb./ft.)
Terminal Posts:	
Type 2:	2-7/8 inch O.D. SCH 40 pipe (0.160 inch wall thickness, 4.64 lb./ft.)
Fittings:	
Tension and Brace Bands:	Polymer coating, 6 mils minimum, over hot-dipped galvanized pressed steel.
Caps, Eye Tops, Rail Ends:	Polymer coating, 6 mils minimum, over hot-dipped galvanized pressed steel.
Sleeves:	Polymer coating, 6 mils minimum, over hot-dipped galvanized pressed steel.
Tie Wires:	Polymer coating, 6 mils minimum, over zinc-coated steel wire.

180-2.2 CONCRETE. Provide commercial grade concrete with a minimum 28-day compressive strength of 2,500 psi or an approved, pre-mixed, sacked concrete.

CONSTRUCTION REQUIREMENTS

180-3.1 GENERAL. Construct the fence in accordance with the details shown on the plans. Establish the fence alignment as shown on the plans.

180-3.2 INSTALLING POSTS. Set all end posts, corner posts, and pull posts at the required dimensions and depths and at the spacing shown in Alaska Standard Plan F-01. Set line posts in concrete as shown on the plans.

Place posts at the intervals shown on the plans but in no case more than 10 feet apart. Thoroughly compact around the posts by tamping or vibrating. Compact backfill to a smooth surface slightly higher than the surrounding ground and sloped to drain away from the posts. Set all posts plumb and to the required grade and alignment.

METHOD OF MEASUREMENT

180-4.1 Measured along the top of the fence from center to center of end posts, excluding the length occupied by gate openings.

BASIS OF PAYMENT

180-5.1 At the contract unit price per linear foot of fence.

Work and materials involved in clearing and disposal of material along the fence line is subsidiary.

Payment will be made under:

Item F180.010.0006	6-foot Screen Fence – per linear foot
Item F180.010.0008	8-foot Screen Fence – per linear foot