SECTION 32 31 00
EXPANDED METAL FENCING
Meets “Buy American Procurement”

PART 1 GENERAL

1.1 SUMMARY
- A. Section Includes
  1. Supply and install all materials and accoutrements required for the installation of the Secura Fence System™ Maximum Security.

1.2 SYSTEM DESCRIPTION
- A. As manufactured by Alabama Metal Industries Corporation, (AMICO), Secura Mesh Fence Fabric shall be made from a sheet of steel that is simultaneously slit and stretched into a rigid, open mesh diamond making one continuous sheet that cannot unravel. The finished shape of the mesh openings shall be diamond. Conventional expanded metal not manufactured specifically for security purposes is NOT permitted for this use. “No Access Fittings” shall be used to install the Secura Fence System™. The supply of the mesh fabric and fittings to attach mesh to framework and their respective coatings shall be supplied by one source to ensure the quality and level of security required.

1.3 SHOW ON DRAWINGS
- A. Location of work
- B. Type(s) outside diameter of all fence posts
- C. Height of Fence
- D. Fittings quantity and usage
- E. Post spacing
- F. Type(s) and location of gate(s)
- G. Type of finish
- H. Barbed Wire or Barbed Tape Requirements

1.4 RELATED SECTIONS .
- A. ___ Earthwork
- B. ___ Concrete

1.5 REFERENCES
- A. ASTM International (ASTM): A121 Specification for Metallic-Coated Carbon Steel Barbed Wire
  2. A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  3. A307 Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
  4. A500 Standard Specification for Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
  5. A1011 Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural High Strength Low Alloy with Improved Formability
  6. F626 Specification for Fence Fittings
  7. F900 Specification for Industrial and Commercial Swing Gates
  8. F1267 Specification for Metal, Expanded Steel
  9. F1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework
  10. F1083 Specification for Pipe, Steel, Hot-Dipped Zinc coated (Galvanized) Welded, For Fence Structures
  11. F1184 Specification for Industrial and Commercial Horizontal Slide Gates
  12. F1910 Standard Specification for Long Barbed Tape Obstacles
  13. F1911 Standard Practice for Installation of Barbed Tape
  14. F2200 Specification for Automated Vehicular Gate Construction
  15. F2548 Standard Specification for Expanded Metal Fence Systems for Security Purposes
  16. F2780 Standard Guide for Design and Construction of Expanded Metal Security Fences and Barriers
- B. Alabama Metal Industries Corporation

1. Wind Load Fence Post Calculator – Open Link to Wind Load Calculator
2. Secura Fence System Literature

C. Wheatland Tube –
1. Schedule 40 Pipe to meet ASTM F 1083 Specification for Pipe, Steel, Hot-Dipped Zinc coated (Galvanized) Welded, For Fence Structures.
2. WT-40 and hot dip galvanized ASTM F 1083, Regular, Intermediate and High Strength Grades.

1.6 PERFORMANCE REQUIREMENTS

A. Fence design, materials and installation must meet ASTM F2548 and ASTM F2780.

1.7 SUBMITTALS

A. Product Data: manufacturer's data including product brochures, details and specifications prior to ordering.
B. When a color coated finish is required a representative color sample with the 8mill finish shall be approved by owner or owner's representative.
C. LEED Requirements
a. MR Credits 2.1 and 2.2 – Construction Waste Management
b. MR Credits 4.1 and 4.2 – Recycled Content
c. MR Credits 5.1 and 5.2 – Regional Materials

1.8 QUALIFICATIONS

A. Manufacturer Qualifications: Minimum 10 years experience in manufacture of expanded metal fencing.
B. Contractor Qualifications: Minimum 5 years experience in installation of expanded metal fencing

1.9 DELIVERY, STORAGE AND HANDLING

A. Materials shall be stored in a clean dry location with proper ventilation to avoid damage. Materials shall be protected against damage from vandalism, theft and job site traffic. In the event of freight damage, note freight bill and contact manufacturer immediately.

PART 2 PRODUCTS

2.2 MANUFACTURER

A. The expanded metal perimeter fence system shall conform to the specifications written for the Secura Fence System™ and manufactured by ALABAMA METAL INDUSTRIES CORPORATION, (AMICO), 3245 Fayette Avenue; Birmingham, AL 35208; Telephone 800/366-2642; Facsimile 205/786-6527; website www.amico-securityproducts.com or emailto:securafence@gibraltar1.com.

2.3 MATERIALS

A. AMICO SECURA MESH shall conform to the following.
1. Style - ASF.50 – 13R MODIFIED
2. Panel height – [8-feet] [10-feet] [12-feet] or any cumulative height as required
3. Panel width – [3-feet] [4-feet] [5-feet] [6-feet]
4. Mesh diamond width – 0.500-inch x 1.20-inch long bond to bond with 24 diamonds per lineal foot
5. Mesh size opening – width 0.250 – 0.261-inch x 0.80 – 0.86-inch long allowing 25 – 30 percent open area
6. Weight galvanized or color coated – 3.10 pounds per square foot

1. Style – ASF 1.0-7R HEAVY MODIFIED
2. Panel height – [8-feet] [10-feet [12-feet] or any cumulative height as required
3. Panel width - [3-feet] [4-feet] [5-feet] [6-feet]
4. Mesh diamond width – 0.875-inch x 2.20-inch long bond to bond with 11 diamonds per lineal foot
5. Mesh size opening – width 0.450 – 0.500-inch x 1.550-inch long allowing 39 – 41 percent open area
6. Weight galvanized or color coated – 4.79 pounds per square foot

Style – ASF1.0-7R STANDARD shall conform to the following.

Panel height – [8-feet] [10-feet] [12-feet] or any cumulative height as required
Panel width - [3-feet] [4-feet] [5-feet] [6-feet]
Mesh diamond width – 1.00-inch x 2.25-inch long bond to bond with 11 diamonds per lineal foot
Mesh size opening – width 0.500 – 0.5625-inch x 1.500-inch long allowing 39 – 41 percent open area
Weight galvanized or color coated – 3.78 pounds per square foot

B. CAP SHEET PANEL shall conform to the following.
   1. Style - ASF.50 – 13R preformed prior to hot dip galvanizing or color coating
   2. Panel height – Standard 38-inch panel projected at 45 degrees provides an increase in height of 26-1/2 inches
   3. Panel width – [8-feet] [10-feet] [12-feet]
   4. Mesh diamond width – 0.500-inch x 1.20-inch long bond to bond with 24 diamonds per lineal foot
   5. Mesh size opening – width 0.313-inch x 0.938-inch long allowing 58 percent open area
   6. Weight galvanized or color coated – 1.73 pounds per square foot

C. TRENCHFILL PANEL
   1. Style - ASF1.5 – 6R Hot Dip Galvanized
   2. Panel vertical dimension – [2 feet] [3 feet] [As Required]
   3. Panel width – [6 feet ~ 6 inches] [7 feet ~ 6 inches] [As Required]
   4. Mesh diamond width – 1.330 inch x 3.00 inch long bond to bond with 9 diamonds per lineal foot
   5. Mesh size opening – width 1.000 inch x 2.313 inch long allowing 63 percent open area
   6. Weight galvanized – 2.73 pounds per square foot

2.4 ATTACHMENT HARDWARE

A. MESH TO FRAMEWORK FITTINGS
   1. VERTICAL FENCE FITTINGS - Maximum Security Fittings Selection – [ASF.50-13R MODIFIED] [ASF1.0-7R HEAVY MODIFIED] [ASF1.0-7R STANDARD]. Secura Mesh Fence Fabric shall be installed using all pre-punched [hot dip galvanized] [color coated] steel fittings as manufactured by Alabama Metal Industries Corporation, (AMICO), and sized to specific framework.
      a. Secura Bands shall be 10GA x 2-inch steel with 3-inch neck and slotted hole using one each 1/2-inch x 2-inch carriage bolt. Secura Bands shall be sized to match the outside diameter of the terminal, corner and gate posts. Install Secura Bands as noted on drawing. Install one Secura Band below the bottom rail, one above the top rail and the remaining Secura Bands evenly spaced between the rails.
      b. Secura Clamps shall be 10GA x 2-inch steel with 2 slotted holes using 2 each 1/2–inch x 2-inch carriage bolts. Secura Clamps shall be sized to match the outside diameter of the line posts. Install Secura Mesh as noted on drawings. Install one Secura Clamp below the bottom rail, one above the top rail and the remaining Secura Clamps evenly spaced between the rails.
      c. For vertically orientated panels Secura Clamps shall be 10GA x 2-inch steel with 2 slotted holes using 2 each 1/2-inch x 2-inch carriage bolts. Secura Clamps shall be sized to match the outside diameter of the horizontal rails. Three Secura Clamps shall be installed per rail per panel.
      d. For horizontally orientated panels Secura Clamps shall be 10GA x 2-inch steel with 2 slotted holes using 2 each 1/2-inch x 2-inch carriage bolts. Secura Clamps shall be sized to match the outside diameter of the horizontal rails. Secura Clamps shall be spaced at a maximum of 16-inches apart along the horizontal rails.

      e. Secura Back Straps shall be 10GA x 2-inch steel with 2 slotted holes using 2 each 1/2-inch x 2-inch carriage bolts. Use 2 less Secura Back Straps than the height of the fence and shall be installed per (minimum 3-diamond) mesh overlap between posts using Secura Clamps as noted on the drawings. Install one Secura Back Strap below the bottom rail and one above the top rail and the remaining Secura Back Straps evenly spaced.

B. FRAMEWORK FITTINGS
   1. Rails shall be secured to 2-1/2-inch O.D. line posts using pressed steel Line Rail Clamps x 12GA.

2. Rails shall be secured to [3-inch] [3-1/2-inch] [4-inch] [4-1/2-inch] [6-5/8-inch] O.D. line posts using pressed steel OFFSET Line Rail Clamps x 12GA.
3. Line posts, corner posts, terminal posts and gate posts shall be fitted with a [pressed steel] [malleable iron] cap of the appropriate size.
4. As required line posts, corner posts and terminal posts shall be fitted with 45 degree barbed arm used to support barbed wire and or barbed tape.
5. Horizontal rails shall connect and be secure to terminal, corner and gate posts using the appropriate sized heavy industrial tension bands and 1-5/8-inch [malleable iron] [pressed steel] rail end cups.

C. CAPSHEET FITTINGS
1. Line posts, corner posts and terminal posts shall be fitted with 45 degree AMICO Secura Angle used to support a 2 inch O.D. Schedule 40 Cap Sheet Pipe. Installed on end of the Cap Sheet Pipe a 2-inch pressed steel cap to keep out moisture.
2. Cap Sheet mesh panels shall overlap the vertical mesh panels at the vertical fence top rail using Secura Clamps. The same 1-5/8-inch Secura Clamp secures both panels to this top rail.
3. Secura Clamps shall be 2-inch x 11GA x 1-inch steel with 2 slotted holes using 2 each 3/8-inch x 2-inch carriage bolts. Three each clamp shall be installed to secure the Cap Sheet mesh to the 2-inch Cap Sheet Pipe.
4. Secura Clamps shall be 1-5/8-inch x 11GA x 1-inch steel with 2 slotted holes using 2 each 3/8-inch x 2-inch carriage bolts. Install 6 each clamps (for 8-foot 9-inch post spacing) to secure the Cap Sheet mesh to the Cap Sheet top rail.

D. TRENCHFILL FITTINGS
1. TrenchFill Panels shall be attached to the bottom rail of the vertical fence panel using Secura Clamps.
2. The same Secura Clamps that attach the vertical fence panel to the bottom rail shall also secure the TrenchFill Panels to same the bottom rail.
3. Secura Clamps shall be 10GA x 2-inch steel with 2 slotted holes using 2 each 1/2-inch x 2-inch carriage bolts. Secura Clamps shall be sized to match the outside diameter of the horizontal rails.

E. ADDED SECURITY ACCOUTREMENTS
1. Barbed Wire
   a. Steel barbed wire of 80 rods each, Coating Type Z, Coating Class 3, Design Number 12-2-4-14R, to ASTM
      A121, with certification.
   b. Barbed Wire shall meet the material requirements and installation per ASTM A121.
   c. Barbed Wire shall be installed using the manufacturer's approved method of attachment.

2. Barbed Tape Barbed Tape shall be 18-inch single coil helical with stainless steel barb and Class III galvanized steel.
   b. core wire having 33 coil loops per 50 lineal foot coil.
   c. Barbed Tape shall meet ASTM F1911 Standard Practice for Installation of Barbed Tape.
   d. Barbed Tape shall be installed using the manufacturer's approved method of attachment.

F. GENERAL FITTINGS CONDITIONS
1. After installation all threaded fasteners shall be peened, scarfed or welded to prevent removal.
2. Any additional line, terminal and or gate fittings shall be classified as industrial grade and conform to ASTMF626.
3. Mesh panels and Secura Fittings to secure the mesh to framework shall be supplied by single source manufacturer.

2.5 FINISH
A. Galvanized Finish
1. Hot dip galvanized mesh panels and fittings shall meet ASTMA123.
B. Color Coated Finish

1. All materials shall be color coated to match owner's color using the AMICO Trinity Plus 8-mil minimum finish.
2. Color Coating mesh panels and fittings shall meet or exceed the Trinity Plus 8-mil minimum application process as manufactured by AMICO. Materials shall be steel shot blasted prior to an 8-step washing and cleaning process. A three coat wear surface is applied; electro-deposition E-coat; prime coat of rich powder or polyolefin powder resin; and a top coat with the proper TGIC polyester resin powder.
3. Color Coating Finish shall be free of corrosion (rust only) during the warranty period, subject to the limitations set forth in the manufacturer's 10-year limited warranty.
4. Framework (Vertical Posts and Horizontal Rails) shall be vinyl coated to meet ASTM F1043.
5. Threaded fasteners shall be painted after installation which includes scarfing or peening with paint to match. A cardboard template shall be used to protect against overspray.

2.6 FRAMEWORK

A. Vertical Fence Framework

1. Round line posts shall utilize Schedule 40 Pipe as noted on drawings for posts.
   a. Post spacing shall be set at a maximum of 7-feet 9-inches on center when using 4-foot wide panels.
   b. Post spacing shall be set at a maximum of 9-feet 9-inches on center when using 5-foot wide panels.
   a. Post spacing shall be set at a maximum of 7-feet 9-inches on center when using 8-foot wide panels.
   b. Post spacing shall be set at a maximum of 9-feet 9-inches on center when using 10-foot wide panels.
2. Round terminal posts shall utilize Schedule 40 Pipe as noted on drawings.
3. Round corner posts shall utilize Schedule 40 Pipe as noted on drawings.
4. Round gate posts shall utilize Schedule 40 Pipe as selected by owner's engineer and noted on drawings.
5. Each 1-5/8-inch O.D. Schedule 40 pipe horizontal rails shall be installed between line posts. The top rail shall be installed 8-inches below the top of the mesh panels. The bottom rail shall be installed 8-inches up from the bottom of the mesh panel.
6. The middle rail shall be installed midway between the top and bottom rails.
7. Barbed arms shall be installed allowing the top rail to pass through the barbed arm. Secura Clamps shall be installed to secure the top edge of the mesh to the rail.

2.7 GATES

A. Single Swing Gates

1. Welded construction and designed to operate under the added weight of the specified Secura Mesh panel(s) and the affects of additional wind loading designed per ASTM F900 Specification for Industrial and Commercial Swing Gates.
2. All swing gates shall be covered with Secura Mesh fitting flush on all sides of the gate frame allowing no open spaces between the fabric and the gate frame.
3. Due to the added weight of the Secura Mesh additional bracing may be required.
4. Secure mesh to all gate frame members with AMICO "No Access" 2-inch x 10GA x 2-inch Secura Bands using one less Secura Band than the length (height and length in feet) of each member.
5. Secure mesh to gate bracing members with AMICO "No Access" 2-inch x 10GA x 2-inch Secure Clamps at a maximum of 16-inches on center.
6. Secure any mesh to mesh joints with AMICO "No Access" 10GA x 2-inch Secura Back Straps evenly spaced over the joint allowing a minimum three diamond overlap using two less Secura Back Straps than the height of the gate leaf.
7. Gate Hinges shall be structurally capable of supporting the gate leaf and allow the gate to open a full 180 degrees and close without binding.
8. The installed gate latch shall be capable of retaining the gate in a closed position and shall have provision for a padlock.

B. Double Drive Gates

1. Welded construction and designed to operate under the added weight of the specified Secura Mesh panel(s) and the affects of additional wind loading designed per ASTM F900 Specification for Industrial and Commercial Swing Gates.
2. All swing gates shall be covered with Secura Mesh fitting flush on all sides of the gate frame allowing no open spaces between the fabric and the gate frame.
3. Due to the added weight of the Secura Mesh additional bracing may be required.
4. Secure mesh to all gate frame members with AMICO "No Access" 2-inch x 10GA x 2-inch Secura Bands using one less Secura Band than the length (height and length in feet) of each member.
5. Secure mesh to gate bracing members with AMICO "No Access" 2-inch x 10GA x 2-inch Secure Clamps at a maximum of 16-inches on center.
6. Secure any mesh to mesh joints with AMICO "No Access" 10GA x 2-inch Secura Back Straps evenly spaced over the joint allowing a minimum three diamond overlap using two less Secura Back Straps than the height of the gate leaf.
7. Gate Hinges shall be structurally capable of supporting the gate leaf and allow the gate to open a full 180 degrees and close without binding.
8. The installed gate latch shall be capable of retaining the gate in a closed position and shall have provision for a padlock.

C. Horizontal Slide Gates
1. Welded construction and designed to operate under the added weight of the specified Secura Mesh panel(s) and the affects of additional wind loading designed per ASTM F1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates.
2. All horizontal slide gates shall be covered with Secura Mesh fitting flush on all sides of the gate frame allowing no open spaces between the fabric and the gate frame.
3. Due to the added weight of the Secura Mesh additional bracing may be required.
4. Secure mesh to gate frame end members with AMICO "No Access" 2-inch x 10GA x 2-inch Secura Bands using one less Secura Band than the length (height and length in feet) of each member.
5. Secure mesh to gate vertical support members and bracing with AMICO "No Access" 2-inch x 10GA x 2-inch Secure Clamps at a maximum of 16-inches on center.
6. Secure any mesh to mesh joints with AMICO "No Access" 10GA x 2-inch Secura Back Straps evenly spaced over the joint allowing a minimum three diamond overlap using two less Secura Back Straps than the height of the gate leaf.
7. Gate Hinges shall be structurally capable of supporting the gate leaf and allow the gate to open a full 180 degrees and close without binding.
8. The installed gate latch shall be capable of retaining the gate in a closed position and shall have provision for a padlock.

D. Cantilever Gates
1. Welded construction and designed to operate under the added weight of the specified Secura Mesh panel(s) and the affects of additional wind loading designed per ASTM F1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates.
2. All horizontal slide gates shall be covered with Secura Mesh fitting flush on all sides of the gate frame allowing no open spaces between the fabric and the gate frame.
3. Due to the added weight of the Secura Mesh additional bracing may be required.
4. Secure mesh to gate frame end members with AMICO "No Access" 2-inch x 10GA x 2-inch Secura Bands using one less Secura Band than the length (height and length in feet) of each member.
5. Secure mesh to vertical members gate and bracing with AMICO "No Access" 2-inch x 10GA x 2-inch Secure Clamps at a maximum of 16-inches on center.
6. Secure any mesh to mesh joints with AMICO "No Access" 10GA x 2-inch Secura Back Straps evenly spaced over the joint allowing a minimum three diamond overlap using two less Secura Back Straps than the height of the gate leaf.
7. Gate Hinges shall be structurally capable of supporting the gate leaf and allow the gate to open a full 180 degrees and close without binding.
8. The installed gate latch shall be capable of retaining the gate in a closed position and shall have provision for a padlock.

PART 3 EXECUTION

3.1 INSTALLATION

A. VERTICAL FENCE INSTALLATION

1. Installation and lay-out of the job shall be approved by the owner or general contractor prior to installation.
2. Fence posts spacing shall be set on centers as noted on drawings.
3. Vertical mesh panels shall be installed flush to the ground.
4. The number and spacing of fittings securing the mesh to the framework and mesh to gate frames shall be determined by the manufacturer.
5. Vertical mesh panels (with Short Way of Diamond running horizontal) shall overlap three diamonds with diamonds orientated in the same direction. Overlapping panels shall mesh together with diamonds in adjoining panel.
6. Horizontal running mesh panels (with Short Way of Diamond running vertical) shall overlap at the line posts and horizontal mid rails.
7. Horizontal mesh panels shall have the cant of the diamond installed facing downward. The top rail shall be installed eight inches below the top of the Secura Mesh panel.
9. The bottom rail shall be installed eight inches above the bottom of the Secura Mesh panel.
10. The vertical mesh panel shall be installed to the outside of the TrenchFill Panel and to the inside of the Cap Sheet Panel as to not allow an edge to climb or breach.
11. All mesh panels shall fit flush on all sides of corner posts, gate posts, and gate frames, allowing no open space between fabric and post or respective gate frame. Only allow for room for the gate to swing.

B. CAPSHEET PANEL INSTALLATION

1. AMICO Fabric Cap Sheet shall be ASF.50-13R mesh pre-formed prior to installation.
2. The Fabric Cap Sheet is formed by bending a 45 degree angle(s) in the Secura Mesh panel.
3. A malleable iron 45 degree Secura Angle fitting is placed on each post and secured by a 3/8-inch set screw.
4. Secura Angle's fit both 3-inch O.D. and 4-inch O.D. posts.
5. 1.900-inch O.D. Schedule 40 Pipe x 38-inch shall provide the overhang extension.
6. Install 3 each 2 inch Secura Clamps to secure the Cap Sheet panel to the 38-inch Cap Sheet pipe.
7. 1-5/8-inch O.D. Schedule 40 pipe shall be cut and installed between outer ends the 1.900-inch O.D. pipe extension.
8. The Cap Sheet top rail shall be connected to the outer end of Cap Sheet overhang pipe by using 2-inch x 11GA x 1-inch galvanized Secura Bands at terminals with a 1-5/8-inch pressed steel rail end cups using 5/16-in. x 1-1/4 inch carriage bolts.
9. The Cap Sheet top rail shall be cut to fit and be connected to the outer end of Cap Sheet overhang pipe by using 2-inch x 11GA x 1-inch galvanized Secura Clamps between line posts with a 3/8-inch x 2-inch x carriage bolts.
10. The installation of 1-5/8-inch x 11GA x 1-inch Secura Clamps shall be evenly spaced to secure the outer edge of the cap sheet to the Cap Sheet top rail. The quantity shall be 2 less than the width (in feet) between adjacent posts.
11. If specified barbed tape can be installed to the secure side of the vertical upswing portion, or on the attack side of the vertical upswing portion of the Cap Sheet and or on top of the fabric Cap Sheet by the use of 9GA hog rings spaced per the barbed tape manufacturers' recommendation.

C. TRENCHFILL PANEL INSTALLATION

1. The TrenchFill Panel and the bottom of the vertical fence panel are attached to the bottom rail using AMICO "No Access" 1-5/8-inch x 10GA x 2-inch Secura Clamps.

D. SECURITY ACCOUTREMENT INSTALLATION

1. Install [3-strands of barbed wire shall be attached to 3-wire barb wire arms] [6-strands of barbed wire shall be attached to 6-wire barb wire arms] [6-strands of barbed wire shall be attached to 6-wire barb wire arms plus barbed tape in the valley of the 6-strands of barbed wire].

2. Barbed tape shall be attached to barbed wire or tension wire located in the outer position of the arm using tie wires for detention applications are stainless steel 16GA minimum, for commercial and industrial applications stainless steel 18GA.
3. Barbed tape loops and attachment points shall be 18-inches on center.
4. When barbed wire is specified gate frame shall have the frame end members extended in height to accommodate three strands of barbed wire uniformly spaced and positioned so that the top strand is approximately 1-foot above the top horizontal member of the gate frame, except when barbed wire is to be installed at the top of gates fitted with automatic gate operators the barbed wire installation shall be in accordance with ASTM F2200.

E. INSTALLATION – GENERAL CONDITIONS
1. All fence signs shall be placed on the outside of the Secura Fence.
2. Tighten all nuts and peen, scarf or weld the threads of the carriage bolts.
3. Clean up area removing any trash.

END OF SECTION