HIGH SECURITY WELDED MESH FENCE

TECHNICAL SPECIFICATION-INSTALLATION OF SECURITY FENCE FOR PIPELINE CORRIDOR TANK

1. SCOPE

This specification establishes the material and construction requirements for the High Security Fence - Welded Mesh (HSF-WM). Materials and construction shall conform to the applicable sections of the following documents:

- **EN 10016-2:** Non-alloy steel rod for drawing and/or cold rolling.
- **EN 10218-2:** Steel wire and wire products - Part 2: Wire dimensions and tolerances.
- **EN 10223-7:** Steel wire and wire products for fences - Part 7: Steel wire welded panels for fencing.
- **EN 10244-2:** Steel wire and wire products - Non-ferrous metallic coating on steel wire - Part 2: Zinc or zinc alloy coating on steel wire.
- **EN 10245-1:** Steel wire and wire products - Organic coating on steel wire - Part 1: General rules.

1.1 FENCING

1.1.1 High Security Fence - Welded Mesh (HSF-WM)

The fencing panels shall be made from galvanized steel wires, welded and subsequently polyester-coated. The fence panels shall have a height of **2.42 meters** and be supported by a continuous concrete ground beam. The panels consist of round horizontal wires and thicker round vertical wires. The horizontal wires are doubled every **1210mm**, starting with a double wire at the bottom and ending with a double wire at the top.

The external face of the fence shall be fitted with a single coil of clipped razor tape with medium barbs, placed in one row at the top and one row at the bottom.

Posts:

- **Corner and line posts** shall be equipped with extension arms that support six horizontal strands of concertina barbed wire (three on each side).
- The extension arms and barbed wire shall support a single coil of clipped razor tape:

    - **965mm** diameter coil for fixing on the face of the fence.
    - **620mm** diameter coil for fixing on top of the fence.

VIEW ON ATTACK FACE

FIGURE–1

1.1.2 Special Requirements for Fence Alignment for HSF-WM

The fencing shall be installed in straight lines, minimizing changes in direction. The fence shall be no less than **10 meters** from any valve chamber, structure, or building within the secure area.

2. FENCING MATERIAL

2.1 Fence Panel

Products shall be new and sourced from a recognized and qualified fence manufacturer. The Company will accept security fences as equal if they meet the following specifications regarding design, size, metal gauge, coating, and fabrication:

The panels are produced using **electrical resistance welded galvanized wires**, which are then polyester-coated.

2.1.1 Height of the Panel

- **Height:** 190mm x 12.7mm = **2413.0 ± 2.5 mm** measured center-to-center.
- **Overall Height: 2416 ± 3 mm.**

2.1.2 Width of the Panel

- **Standard Width:** 30mm x 76.2mm = **2286 ± 2.5 mm**, measured center-to-center.
- **Overall Width (excluding overhangs): 2292 ± 3 mm.**

2.1.3 Mesh Dimensions and Tolerances

The nominal mesh dimensions are measured between the centers of two neighboring wires:

- **Distance between vertical wires: 76.2 ± 2 mm**
- **Distance between horizontal wires: 12.7 ± 1 mm**

2.1.4 Wire Diameter

- **Diameter of horizontal wires: 4.00 ± 0.08 mm**
- **Diameter of vertical wires: 6.00 ± 0.09 mm**

2.1.5 Tensile Strength

- **Horizontal wires: 600 to 810 N/mm²**
- **Vertical wires: 400 to 550 N/mm²**

2.1.6 Wire Rod

- **Chemical Composition:** See table below (if applicable).

Chemical composition	
Element	%
C	≤0.10
Si	≤0.30
Mn	≤0.60
P	≤0.035
S	≤0.035

The wire rod is in accordance with the European standard EN 10016-2.The designation of the wire rod is C9D.

2.1.5 Panel Installation

Welded mesh panels are fabricated to match the specified width and height. The panels are attached using a continuous cover plate (120 mm x 5 mm x 2436 mm) made of galvanized and polyester-coated steel. The cover plates have pre-drilled slots and are spaced 330.2 mm apart. They are connected to the vertical posts using M8 x 35/40 socket button head bolts, washers, and self-locking nuts made of A2 grade stainless steel.

3. Coating

3.1 Metallic Coating

The wires are galvanized with a minimum zinc weight of:

- 275 g/m² for horizontal wires
- 290 g/m² for vertical wires

3.1.1 Organic Coating

After welding, the panels are polyester coated. The layer thickness is determined by taking the average of 10 measurements on one panel and must be at least 150 micrometers (µm).

Adhesion of Polyester:

A scratch is made in the longitudinal direction of the wire using a hard, pointed metal tool that penetrates the metal. The scratch length should be approximately 50 mm. The coating should not be lifted from the metal by more than 5 mm.

Resistance of Polyester to Salt Spray:

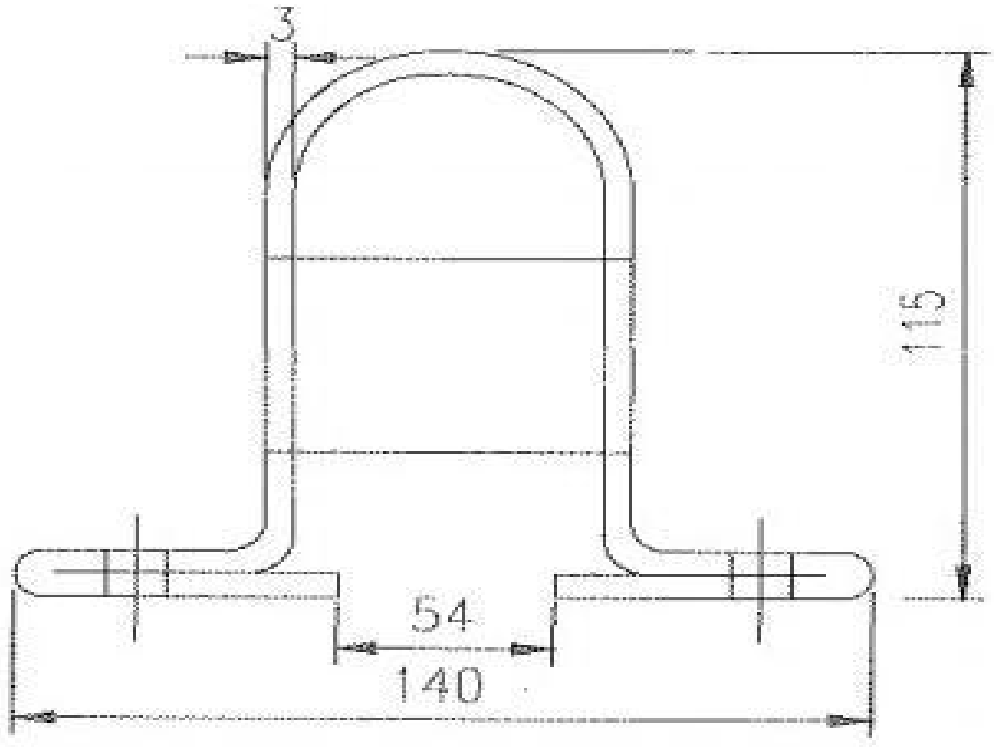
A scratch is made in the longitudinal direction of the wire using a hard, pointed metal tool that penetrates the metal. The scratch length should be approximately 50 mm. The test is conducted according to ISO 9227. After 1000 hours, there should be no under-film corrosion, loss of adhesion exceeding 10 mm from the scratch, and no signs of blistering, cracking, or crazing on any part of the specimen.

4. Fence Post

4.1 Scope

The posts are made of steel, hot-dip galvanized for corrosion resistance, and then polyester coated. The posts are pre-drilled to facilitate assembly with other components.

The fence post profile is 140 mm x 115 mm x 3 mm (see Fig. 2). A steel footplate is welded to the bottom of the fence post for secure installation.



140X115X3 FIGURE-2

4.1.2 Post Materials

The materials and construction of the posts shall comply with the following standards:

- **EN 10027-1:** Designation system for steel - Part 1: Steel names
- **EN 10292:** Continuous hot-dip coated strip and sheet of steels with higher yield strength for cold forming - Technical delivery conditions
- **EN 13438:** Powder organic coatings for galvanized steel products for construction purposes
- **ISO 1461:** Hot-dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods

The steel used for the fence posts shall be designated as H380LADZ275 MAC, according to EN 10292, with a minimum yield strength of 380 N/mm².
Chemical composition:see table below

Table 1:chemical composition	
C	≤0.10%
Si	≤0.50%
Mn	≤1.40%
P	≤0.025%
S	≤0.025%
Al	≤0.015%

4.1.3 Spacing of Posts

Post spacing shall be as approved by the Company. No terminal, corner, or end posts shall be larger than line posts. Stretching is not required for welded mesh panels at gate posts.

5. COATING

5.1 Metallic Coating

The posts are made from continuously hot-dip galvanized steel strip with a minimum zinc coating weight of 395 g/m² in accordance with ISO 1461.

5.2 Organic Coating

The posts are polyester coated after welding. The layer thickness is determined by averaging 10 measurements on one panel and shall be a minimum of 100 µm.

Adhesion of Polyester: An "X" is scratched into the coating using a hard, pointed metal tool that penetrates the metal. The length of each scratch should be approximately 50 mm. The coating should not lift from the metal by more than 5 mm.

Resistance of Polyester to Salt Spray: An "X" is scratched into the coating using a hard, pointed metal tool that penetrates the metal. The length of each scratch should be approximately 50 mm. The test is conducted according to ISO 9227. After 1000 hours, there should be no under-film corrosion, loss of adhesion exceeding 10 mm from the scratch, and no signs of blistering, cracking, or crazing on any part of the specimen.

6. FOUNDATIONS

6.1 Fence Post Foundations

Fence posts shall be constructed with welded foot plates measuring at least 230mm x 230mm x 15mm. These plates shall be galvanized and polyester-coated and secured to the ground using four M16 chemical anchor bolts with locking nuts and a minimum embedment depth of 300mm.

- **Concrete:** All reinforced concrete shall have a minimum characteristic cube crushing strength of 30 N/mm² at 28 days. Plain concrete shall have a characteristic crushing strength of 15.7 N/mm².
- **Reinforcing Steel:** Steel reinforcement shall comply with ASTM A615/A615M standards.

Continuous sections may be constructed as pre-cast or in-situ units. Adequate movement joints must be provided. The foundation wall is not designed to retain any internal spillage. Drainage passages shall be incorporated to allow for the free passage of liquids while preventing intruder entry or blockage by debris.

6.1.1 Anchor Bolts:

Four M16 chemical anchor bolts with locking nuts shall have a hot-dip galvanized finish.

6.1.2 Foot Plate:

The 230x230x15mm thick foot plate welded to the fence post shall be electronically galvanized and polyester-coated. The minimum yield strength of the foot plate shall be 235 N/mm².

6.1.3 Site Preparation

Prior to installation, all necessary grading and cleaning on both sides of the fence line shall be performed by the contractor. The ground shall be graded to provide a straight, flat, and level surface. Soil or stone fill shall be thoroughly compacted.

7. MISCELLANEOUS MATERIALS

7.1 Barbed Wire Extension Arm

The barbed wire extension arm is made of hot-dip galvanized and polyester-coated steel or malleable iron. It has an L-shaped profile (50mm x 50mm x 5mm thick, 540mm long) with six notches to hold barbed wire rows. The arms are mounted on top of the fence posts and can support a minimum dead weight of 125kg at the outer end. They are securely fixed to the posts using two sets of M8x30 mushroom head square neck bolts with washers and A2 grade stainless steel self-locking nuts.

7.1.1 Installation

Installation of welded mesh panels and components shall follow the manufacturer's recommendations.

7.1.2 Tolerance

Welded mesh panel misalignment from top to bottom is one inch. This tolerance accommodates minor grade changes, out-of-square panels, occasional worker oversight, and post misalignment.

7.1.3 Concertina Barbed Wire and Clipped Razor Tape

- Galvanized and polyester-coated concertina barbed wire shall be used according to the manufacturer's recommendations.
- Stainless steel clipped razor tape with medium barbs and polyester coating shall be used according to the manufacturer's recommendations.

7.2 Future Wiring

The fence design allows for future installation of wiring for CCTV, motion detectors, and similar security systems.