

**ENGINEERING, CONSTRUCTION  
AND  
MATERIAL STANDARD  
FOR  
FENCING AND GATES**

**CONTENTS :**

**PAGE No.**

<b>1. SCOPE .....</b>	<b>2</b>
<b>2. REFERENCES .....</b>	<b>2</b>
<b>3. UNITS .....</b>	<b>2</b>
<b>4. GENERAL DESCRIPTION.....</b>	<b>2</b>
<b>5. MATERIALS .....</b>	<b>3</b>
<b>6. DESIGN .....</b>	<b>3</b>
<b>7. CONSTRUCTION.....</b>	<b>4</b>

## 1. SCOPE

This Standard covers the minimum mandatory requirements for material, design and construction of appropriate types of fencing to be used at Oil Industry’s installations, consisting of masonry, corrugated sheet, open pale and chain link fencing in accordance with sensitivities of locations.

## 2. REFERENCES

In this Standard the following standards and codes are referred to, and to the extent specified, form a part of this Standard.

### **BSI (BRITISH STANDARDS INSTITUTION)**

BS 1722: Part 1: 1986	"Fences/Specification for Chain Link Fences"
BS 1722: Part 10: 1990	"Fences/Specification for Anti-Intruder Fences in Chain Link and Welded Mesh"
BS 1722: Part 12: 1990	"Fences/Specification for Steel Palisade Fences"
BS 5628: Part 3: 1985	"Materials and Components, Design and Workmanship"

### **ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIAL)**

ASTM-A 121-86	"Specification for Zinc-Coated (Galvanized) Steel Barbed Wire"
ASTM-A 392-84	"Specification for Zinc-Coated Steel Chain-Link Fence Fabric"
ASTM-A 641-82	"Specification for Zinc-Coated (Galvanized) Carbon Steel Wire"

### **AWS (AMERICAN WELDING SOCIETY)**

AWS D1.1-90	"Structural Welding Code-Steel"
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### **IPS (IRANIAN PETROLEUM STANDARDS)**

IPS-M-CE-105	"Building Materials"
IPS-M-CE-165	"Materials for Concrete, Mortars and Admixtures"
IPS-C-CE-200	"Concrete Structures"

## 3. UNITS

This Standard is based on International System of Units (SI), except where otherwise specified.

## 4. GENERAL DESCRIPTION

Fencing is intended to provide safe boundary limits at houses and industrial facilities in order to prevent hazardous intrusion of animal, vehicles and people. In those locations where greater protection from trespass and vandalism is required, specially where there is vulnerable equipment or dangerous situation could exist for the intruder, masonry and corrugated sheet type of fencing should be employed, on the other hand at locations with light security provision, open pale type and chainlink fencing should be utilized.

In this Standard for security reasons, the facilities are classified as follows:

- 1) Sensitive installation areas;
- 2) Semi-sensitive installation areas;
- 3) Offices and residential areas.

The appropriate type of fencing to be used at above areas are respectively:

- 1) Masonry and Corrugated sheet security fencing (see Std. Drwgs. IPS-D-CE-300 and IPS-D-CE-303).
- 2) Open Pale and chain link security fencing (see Std. Drwgs. IPS-D-CE-300 and IPS-D-CE-302).
- 3) Chain link fencing (see Std. Drwg. IPS-D-CE-301).

## 5. MATERIALS

Materials for all types of fencing shall be new. Damaged material should not be used. All material should be capable of meeting the requirements of Iranian Petroleum Standards for Building Materials (IPS-M-CE-105).

Shapes and sizes of fencing materials are shown in Standard Drawings IPS-D-CE-300, 301, 302 and 303.

## 6. DESIGN

Chain link, open pale and corrugated sheet fencing should be designed with respect to sensitivity of installations. The designer shall select the proper standard drawing complying with the following requirements:

### 6.1 Posts

The length of line posts, end and corner posts shall allow for a post setting depth of about 0.75 m into concrete footings:

- Line post spacing shall not exceed 3 m.
- End and corner posts shall be braced.
- Caps shall be provided on tubular posts which are not fitted with barbed wire arms.

### 6.2 Fabric

- The top of the fabric shall be a minimum of 2.13 m above grade.
- The bottom of the fabric shall be within 50 mm of finished grade.
- On soft ground, the bottom of the fabric shall extend below grade sufficiently to compensate for shifting sand or soil.
- The maximum spacing of tie wires or connectors for attaching the fabric shall be as follows:
  - a) To posts: 350 mm centers.
  - b) To tension wire: 600 mm centers.

Tension wire shall be furnished at the top and bottom of the fabric. Fabric shall be installed on the designated "Security Side" of fencing.

### 6.3 Barbed Wire

Barbed wire installations, where required, shall be as follows:

- a) Extension arms shall be installed at 45 degrees on the top of each line and corner post to support the barbed wire.
- b) Each arm shall have equally spaced slots to hold the strands by means of lugs or stitch wire at a maximum of 150 mm center spacing.

- c) The topmost barbed wire shall be 300 mm above the fabric and 300 mm from the fence line.
- d) The extension arms shall be capable of withstanding, without failure, 135 kg downward pull at the outermost end of the arm.

**6.4 Pales**

Pales shall be secured to rail at every intersection by the welding method. It shall consist of 3 mm fillet welds at least 30 mm long on each side of pale.

**6.5 Rails**

Open pale and corrugated sheet security fences shall have two horizontal rails of angle section as given in Table 1. The oversail from the center of upper rail fixing to the top of pales and the oversail from the center of lower rail fixing to the bottom of the pale shall be as given in Table 1.

**TABLE 1 - BASIC DIMENSION FOR SECURITY FENCES WITH POST AT 2.75 m IN CENTERS**

POST HEIGHT m	POST SECTION	RAIL SECTION	TOP OVERSAIL	BOTTOM OVERSAIL
3.00	IPE 12	L 50 × 50 × 6	475 mm	380 mm

**6.6 Gates**

Gates shall be provided as specified on the standard drawings No. IPS-D-CE-260, 261 and 262. Standard gate sizes as shown below shall be used:

Personnel Gates	Single Swing	1.2 m wide.
Vehicular Gates	Double Swing	4.8 m wide.

Gates shall be designed to ensure a rigid framework allowing a minimum of sag in the open position. Gates shall be provided with heavy duty hinges that will permit 180° swing, 90° in each direction from close position. Gates shall be provided with drop bolts, slam plates and proper locking devices.

**7. CONSTRUCTION**

Different categories of construction activities shall be according to following requirements:

**7.1 Erection**

Erection of fencing shall be performed by competent workmen, experienced in industrial type fence erection.

**7.2** Particular care shall be exercised during fence erection so that no underground piping, cable or other appurtenances are touched or damaged.

**7.3** On completion of work, all excess and waste materials resulting from fence construction shall be removed from the site.

**7.4** Unless otherwise specified, the fence shall follow ground contour.

**7.5** Posts shall be accurately set to line and grade. Top of post footing shall be slope finished (crowned) to shed water.

**7.6** In case of chain link fences, the fabric shall be properly tensioned and securely fixed to posts and rails or tension wires by means of tie wires. Sags buckles, loose sections or improperly meshed fence shall not be accepted.

7.7 Barbed wires shall be properly tensioned. Sagging shall not be allowed.

7.8 Barbed wires shall be attached to extension arms in such a manner so that the barbed wires can not be bunched together or moved away from the fence top.

7.9 Gates shall be fixed to swing freely without bending.

#### 7.10 Welding

Welding shall conform to AWS D1.1 or other approved welding procedure by the jurisdiction of the AR\*.

#### 7.11 Concrete Work

All concrete work shall conform to Iranian Petroleum Standard for Construction of Concrete Structures (IPS-C-CE-200). Material should conform to IPS-M-CE-165.

#### 7.12 Rubble Masonry Work for Fences at Sensitive Installation Areas

This work shall consist of placing rock in cement mortar beds in such shapes and at such locations as shown on the Std. Drawing IPS-D-CE-303. Rock for rubble masonry shall be clean, hard, durable and free from seams or other imperfections. All weathered rock shall be rejected.

##### 7.12.1 Mortar

Mortar for bedding and pointing shall consist of one part by volume of Portland cement to 2 parts by volume of clean fine aggregate.

Unless otherwise permitted by the AR, mortar shall be mixed in mixing machine. If hand mixing of the mortar is permitted by the AR, the fine aggregate and cement shall be mixed dry in a tight box until the mixture assumes a uniform color, after which water shall be added as the mixing continues. Mortar shall be used within one hour after water has been added and shall not be retempered.

##### 7.12.2 Placing

Rock shall be thoroughly wetted before placing, and shall be laid in full mortar beds, in courses approximately horizontal both in longitudinal and transverse directions. Rocks will not be considered to be properly bedded until mortar exudes from the underside of bedded rocks.

##### 7.12.3 Pointing

Within 24 hours after construction, the joints on all exposed faces shall be raked clear of loose mortar and pointed with the mortar specified in Clause 7.12.1 so that joints are recessed approximately 6 mm. The texture of recessed pointing shall match the texture of the rock used and in no case shall pointing be given a smooth finish. The wall shall be kept wet while the pointing is being done.

#### 7.13 Brick Masonry Work for Fences at Sensitive Installation Areas

All brick masonry shall comply with BS 5628: Par 3: 1985, Section 4, Clause 31 "Batching, Mixing and Use of Mortars" and Clause 32 "Laying of Masonry Units".

Material should conform to IPS-M-CE-105.

\* AR = Authorized Representative of the Owner.