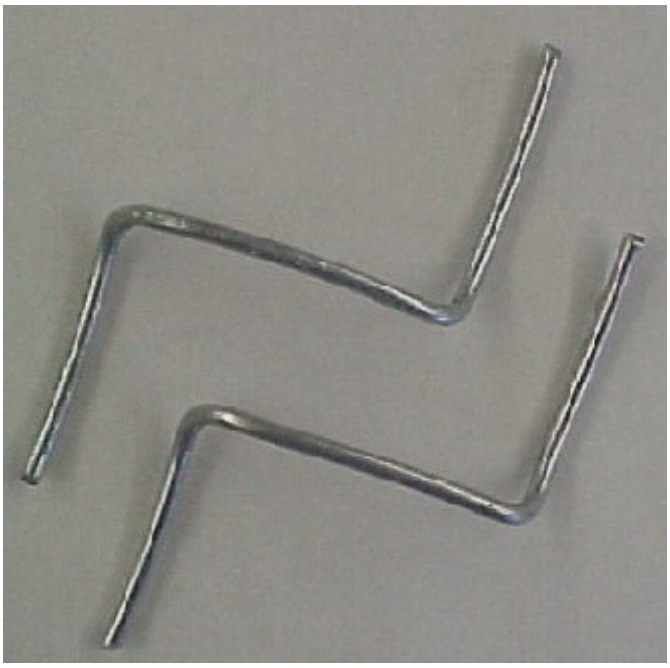
Chain-Link Fence

Under the state specification 710.03 for fencing, ASTM M 181 is called out.

Go to the steel and fencing certification manual for more information about the basic properties of steel.

Dimension Requirements

Dimensions should be verified to assure the delivered product meets what you ordered.



The size of the mesh should be as indicated in the following table.

Size of Wire and Mesh

Specified Diameter of Types I, II, III, and V Coated Wire and Type IV's Metallic-Coated Core Wire			
in.	gage	Size of Mesh, in	Height of Fabric, in.
0.192	6	2	36, 42, 48, 60, 72, 84,96, 108, 120, 144
0.148	9	2	36, 42, 48, 60, 72, 84, 96, 108, 120, 144
0.120	11	2	36, 42, 48, 60, 72, 84
0.120	11	1 ¾	96, 108, 120, 144
0.148	9	1	36, 42, 48, 60, 72, 84
0.120	11	1	36, 42, 48, 60, 72, 84

An example of a size mesh is when the diameter of the mesh is 0.148 inches. This means the size of the mesh is 1 inch and fabric of the fence could have standard heights of 36, 42, 48, 60, 72, or 84 inches.

The permissible variation from the specified size of mesh shall be ± **c** inches. The permissible variation from the specified height shall be ± 1 inch for standard selvage.

The permissible variation from the specified diameter of the wires shall be ± 0.005 inches. For Type I or II fabric, the specified diameter is the coated diameter. For Type III fabric, the specified diameter is the finished wire diameter. For Type IV fabric, the specified diameter is the metallic-coated core wire diameter, and the PVC coating shall not be used when determining wire size.

A typical diamond count for each standard height is shown in the following table. Other diamond counts are permissible provided they are consistent within a lot. The purchaser has the option to specify the diamond count in the order.

Typical Diamond Counts.

Specified Diameter of Types 1, II, III, and V Coated Wire and Type IV's Metallic-Coated Core Wire, in.	Mesh Size, in.	Diamond Count Fabric Height, in.[A]									
		36	42	48	60	72	84	96	108	120	144
0.192	2	10 ½	12 ½	13 ½	17 ½	20 ½	24 ½	27 ½	31 ½	34 ½	41 ½
0.148	2	10 ½	12 ½	13 ½	17 ½	20 ½	24 ½	27 ½	31 ½	34 ½	41 ½
0.120	2	10 ½	12 ½	13 ½	17 ½	20 ½	24 ½	—	—	—	—
0.120	1 ¾	—	—	—	—	—	—	31 ½	35 ½	39 ½	47 ½

[A] Diamond count is not available for one-inch mesh size.

Mechanical Requirements

Along with Dimensional requirements another key issue is the mechanical properties of the material. Listed below is the information that can be found in the applicable specification for steel wire.

Wire constituting the fabric shall meet the minimum breaking strength shown in the following table.

Breaking Loads

Specified Diameter of Types I. II, and III Coated Wire and Type IV's Metallic-Coated Core Wire		Breaking Load		
in.	gage	Type I or II lbf	Type III lbf	Type IV A Core Wire lbf
0.192	6	2170	1560	2170
0.148	9	1290	930	1290
0.120	11	850	610	850

[A] PVC coating may be mechanically removed prior to testing, if desired

An example of the breaking load would be a chain link fence with a wire thickness of 0.148 inches. There is a minimum breaking strength for the four types of wires on the chain link fence. For this example the minimum breaking strength for Type I or Type II and Type IV wire is 1,290 lbf and for Type III the minimum breaking strength is 930 lbf.

Inspection shall be done at the project site. Random samples shall be obtained from material delivered to the project site or at other locations designated by the Laboratory. Samples selected should be inspected for weave, size of mesh, diamond count, wire size, height of fabric, selvage, and length of roll

When specified by the purchaser in the order, a manufacturer's certification that the material was manufactured, sampled, tested, and inspected in accordance with this specification and has been found to meet the requirements shall be furnished. Three certified copies of the chemical and physical properties of each of the aluminum components shall be furnished to the engineer.

Coating Requirements

Chain-link fabric, posts, rails, ties, bands, bars, rods and other fittings and hardware covered by this specification shall be composed of the following Types of material, as specified:

Type I — Zinc-coated steel
Type II — Aluminum-coated steel
Type III — Aluminum alloy
Type IV — Polyvinyl Chloride (PVC)-coated steel
Zinc — 5% Aluminum-Mischmetal alloy

Wire used for zinc-coated chain-link fence may be coated before or after weaving in to fabric. Wire used for aluminum-coated steel chain-link fabric shall be coated before weaving in to fabric. Wire used for PVC-coated chain-link fence shall be coated before weaving in to fabric.

Weight of Metallic Coating Type I or II Fabric

Specified Diameter of Coated Wire		Mass of Coating of Uncoated Wire Surface		
		Type I Zinc		
in.	mm	Class C oz/ft^2	Class D oz/ft^2	Type II Aluminum oz/ft^2
0.192	6	1.2	2.0	0.40
0.148	9	1.2	2.0	0.40
0.120	11	1.2	2.0	0.35

The weight of the metallic coating can not be less than 1.1 oz/ft^2 or 1.8 oz/ft^2 on an individual specimen of Type 1, Class C, or Class D fabric, respectively.

The minimum metallic mass of coating on the wire for Type IV fabric and the thickness of PVC should meet the following requirements as determined from the average of all specimens representing the lot.

Weight or Thickness of Type IV Coating

Specified Diameter of Metallic-Coated Core Wire				PVC Thickness Range	
in.	gage	Weight of Zinc Coating of Uncoated Wire Surface oz/ft2	Weigh of Aluminum Coating of Uncoated Wire Surface oz/ft2	Class A in.	Class B in.
0.192	6	0.40	0.20	0.015 to	0.006 to
0.148	9	0.30	0.20	0.025	0.010
0.120	11	0.30	0.20	All gages	All gages

Note — The PVC coating shall not be used when determining wire size.

Unless stipulated by the purchaser, the color of the PVC in both Class A and Class B fabric should meet these requirements.

Standard PVC Colors

	Munsell Units		
	Medium Green	Dark Green	Black
Hue	7.5G to 2.5 G	0.1G to 7.5G	See chroma tolerance
Value	3.5 to 4.5	2.3 to 3.3	1.3 to 2.1
Chroma	Greater than 6	1 to 4	Max/hue (any hue)

Posts, gate frames, post braces and top rails shall be Type I or Type III material.

Type I material shall also conform to the requirements in the following table, Table 710.03-1.

TABLE 710.03-1
STEEL POSTS, GATE FRAMES, POST BRACES, AND TOP RAILS

Usage - nominal fence height 6 feet or less	Section	Outside Diameter or Dimensions in.	Weight Nominal lb/ft.	Weight Tolerance %	Minimum Yield Strength psi
	Grade 1 Pipe	2.375	3.65	-5	25,800
Line post	Grade 2 Pipe	2.375	3.12	-5	50,000
	C-Section	2.250 x 1.700	2.73	-6	45,000
	H-Section	2.250 x 1.700	3.26	-5	45,000
	Grade 1 Pipe	2.875	5.79	-5	25,800
End, corner pull posts	Grade 2 Pipe	2.880	4.64	-5	50,000
	Square	2.500	5.70	-3	40,000
	Roll-form	3.500 x 3.500	5.14	-6	35,000
Gate Posts, for nominal width of gate (single or one leaf of Double):					
Up to 6 feet incl.	Grade 1 Pipe	2.880	5.79	-5	25,800
	Grade 2 Pipe	2.880	4.64	-5	50,000
	Square	2.500	5.70	-3	40,000
	Roll-form	3.500 x 3.500	5.14	-6	35,000
Over 6 to 13	Grade 1 Pipe	4.000	9.11	-5	25,800
feet incl.	Grade 2 Pipe	4.000	6.56	-5	50,000
	Square	3.000	9.35	-3	40,000
Over 13 to 18 feet incl.	Grade 1 Pipe	6.630	18.97	-5	25,800
Over 18 feet	Round	8.625	24.70	-5	25,800
Gate frames	Grade 1 Pipe	1.900	2.72	-5	25,800
	Grade 2 Pipe	1.900	2.28	-5	50,000
	Square	2.000	2.66	-3	40,000
Top rails,	Grade 1 Pipe	1.660	2.27	-5	25,800
*post braces	Grade 2 Pipe	1.660	1.84	-5	50,000
	H-Section	1.500 x 1.310	2.25	-5	45,000
	Roll-form	1.6250 x 1.250	1.35	-6	35,000
	Round tubing	1.660	1.38	-5	50,000

*When tension wire is specified, it shall be of 4.5 mm diameter.

Type III material shall also conform to the requirements in the following table, Table 710.03-2.

TABLE 710.03-2
DIAMETERS OR PLAIN END,
SCHEDULE 40 ALUMINUM ALLOY PIPE
The weights and dimensions shall be as specified in ANSI H 35.2.

Material		Nominal Pipe Size mm	Nominal Pipe Size in.
Brace rails and top rails		32	1-1/4
Gate frames and rail couplings		40	1-1/2
Line posts		50	2
End and corner posts		65	2-1/2
Gate posts) single or one leaf of double:			
Gate opening meters	feet		
to 1.8	6	65	2-1/2
over 1.8 to 3.7	6 to 12	90	3-1/2
over 3.7 to 5.5	12 to 18	150	6
over 5.5 to 9.8	18 to 32	200	8

Sample Certification

This is to certify that the materials shipped on our invoice/shipping order number 1107900 dated 8/03/00 meets or exceeds the following certifications: Melted and manufactured in America with Domestic origin materials.

I. FABRIC Height 60" Gauge 9 Mesh 2 Selvage KK

A. Zinc Coated:
( ) ASTM A-392, Class I(1.2), RR-F-191 Class A
( ) ASTM A-392, Class II(2.0), RR-F-191 Class D
( ) Melted and Manufactured in the U.S.A.

B. Aluminum Coated:
(X) ASTM A-491, Class II(.40), RF-F-191 Class E
(X) Melted and Manufactured in the U.S.A.

C. Vinyl Clad:
Color: _____
( ) RR-F-191/1 ASTM F668-96, Class 1
( ) RR-F-191/1 ASTM F668-96, Class 2A
( ) RR-F-191/1 ASTM F668-96, Class 2B
( ) Melted and Manufactured in the U.S.A.

II. FRAMEWORK

A. Galvanized Standard Pipe(Grade A): ASTM F1083 (1.8), RR F 191/3B Class I(1.6)
( ) 1 5/8" O.D. weighing 2.27 lbs. per foot
( ) 1 7/8" O.D. weighing 2.72 lbs. per foot
( ) 2 3/8" O.D. weighing 3.65 lbs. per foot
( ) 2 7/8" O.D. weighing 5.79 lbs. per foot
( ) 4" O.D. weighing 9.10 lbs. per foot
( ) 6 5/8" O.D. weighing 18.97 lbs. per foot

B. Galvanized Pipe(Grade B): ASTM A-569, RR-F-191/3B Class I
( ) 1 5/8" O.D. weighing 1.83 lbs. per foot
( ) 1 7/8" O.D. weighing 2.28 lbs. per foot
( ) 2 3/8" O.D. weighing 3.11 lbs. per foot
( ) 2 7/8" O.D. weighing 4.64 lbs. per foot
( ) 4" O.D. weighing 6.56 lbs. per foot

C. Rolled Form C-Section: ASTM A-570 (2.0), RR-F-191/3B Class II (2.0)
( ) 1 1/4" X 1 5/8" C-Rail weighing 1.34 lbs. per foot
( ) 1 7/8" X 1 5/8" Standard C weighing 2.30 lbs. per foot
( ) 2 1/4" X 1 5/8" Heavy C weighing 2.70 lbs. per foot

This sample certification for chain link fence is not correct because they have no data to back themselves up. All they did was send in a bad certification that just says that ASTM A 491 was used and that the wire was melted and manufactured in the USA. For this certification to be good they have to send the sample data for certification to make sure that the material actually passed the inspection.

Sample Certification

This is to certify that the materials shipped on our invoice/shipping order number 4004709 dated 6/5/00 meets or exceeds the following certifications: Melted and manufactured in America with Domestic origin materials.

I. FABRIC Height: Gauge: 10 Mesh: 1 Selvage: KK

A. Zinc Coated:
- **( ) ASTM A-392, Class I(1.2), RR-F-191 Class A**
- **( ) ASTM A-392, Class II(2.0), RR-F-191 Class D**
- **( ) Melted and Manufactured in the U.S.A.**

B. Aluminum Coated:
- **( ) ASTM A-491, Class II(.40), RF-F-191 Class E**
- **( ) Melted and Manufactured in the U.S.A.**

C. Vinyl Clad: **Color: Gray**
- **( ) RR-F-191/1 ASTM F668-96, Class 1**
- **( ) RR-F-191/1 ASTM F668-96, Class 2A**
- **(X) RR-F-191/1 ASTM F668-96, Class 2B**
- **(X) Melted and Manufactured in the U.S.A.**

II. FRAMEWORK

A. Galvanized Standard Pipe(Grade A): ASTM F1083 (1.8), RR-F-191/3B Class
- **( ) 1 5/8" O.D. weighing 2.27 lbs. per foot**
- **( ) 1 7/8" O.D. weighing 2.72 lbs. per foot**
- **( ) 2 3/8" O.D. weighing 3.65 lbs. per foot**
- **( ) 2 7/8" O.D. weighing 5.79 lbs. per foot**
- **( ) 4" O.D. weighing 9.10 lbs. per foot**
- **( ) 6 5/8" O.D. weighing 18.97 lbs. per foot**

B. Galvanized Pipe(Grade B): ASTM A-569, RR-F-191/3B Class I
- **( ) 1 5/8" O.D. weighing 1.83 lbs. per foot**
- **( ) 1 7/8" O.D. weighing 2.28 lbs. per foot**
- **( ) 2 3/8" O.D. weighing 3.11 lbs. per foot**
- **( ) 2 7/8" O.D. weighing 4.64 lbs. per foot**
- **( ) 4" O.D. weighing 6.56 lbs. per foot**

C. Rolled Form C-Section: ASTM A-570 (2.0), RR-F-191/3B Class II (2.0)
- **( ) 1 1/4" X 1 5/8" C-Rail weighing 1.34 lbs. per foot**
- **( ) 1 7/8" X 1 5/8" Standard C weighing 2.30 lbs. per f**
- **( ) 2 1/4" X 1 5/8" Heavy C weighing 2.70 lbs. per foot**

This is another certification for chain link fence that is not right. For one thing they have the thickness of wire as gage 10. The specification for this type of fence is gage 11. ODOT would probably accept this fence since it is heavier than specified but the manufacturer should check with ODOT next time before they install this type of fence again. They should also have provided the strength test data with this certification.