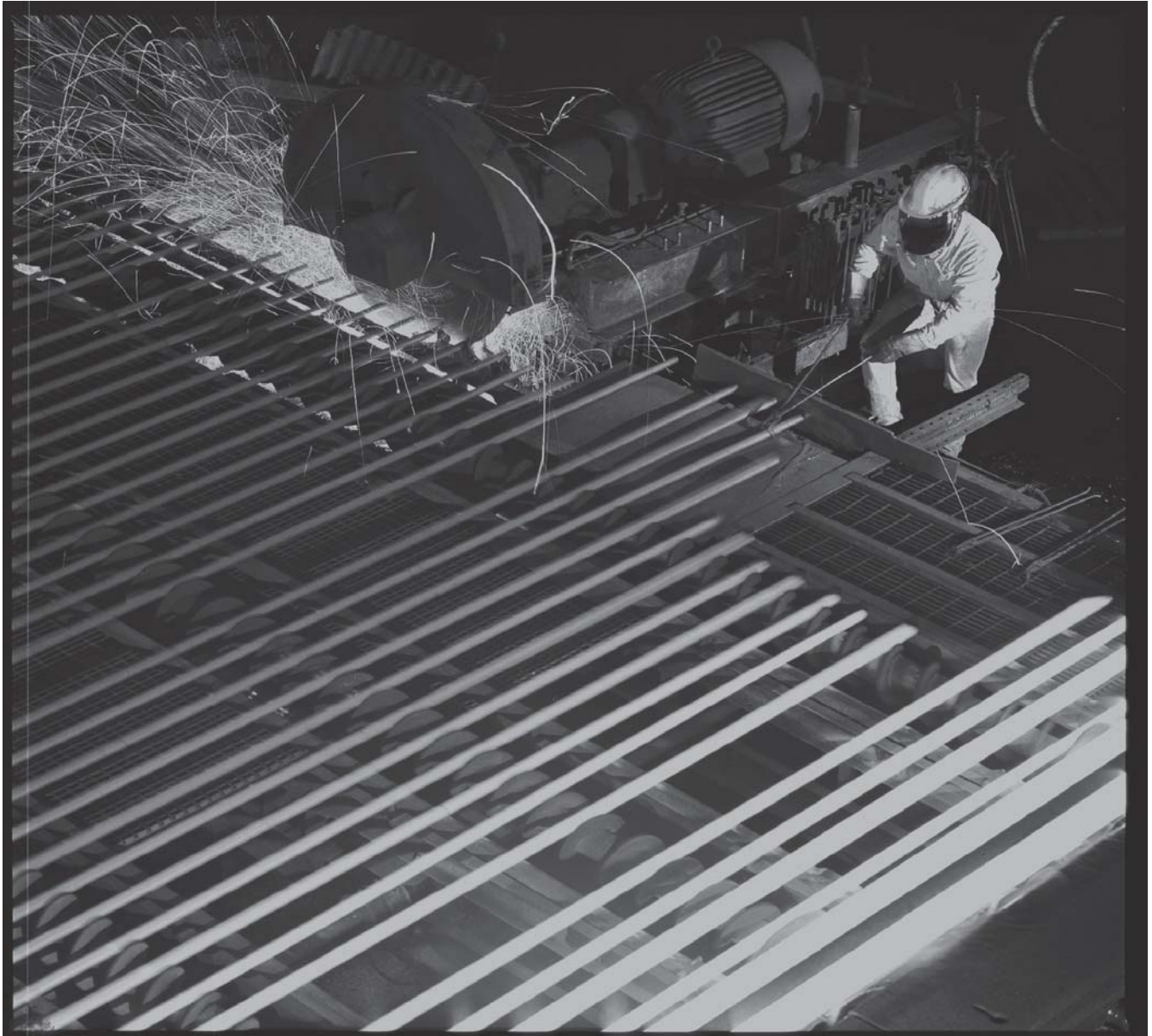




# Wheatland Tube Company



**Includes  
2005 National  
Electrical Code®  
reference**

**Electrical Metallic Tubing (EMT)  
Intermediate Metal Conduit (IMC)  
Hot-Dip Galvanized  
Steel Rigid Metal Conduit (RMC)**



## From Start To Finish, You Get 100% Wheatland Quality

Wheatland controls the manufacture of its hot-dip galvanized steel Rigid Metal Conduit (RMC), Electrical Metallic Tubing (EMT) and Intermediate Metal Conduit (IMC) every step of the way. We fabricate our own tubing from flat steel coils, weld it and do our own galvanizing. Then to be sure you get the same quality throughout the raceway system, we make our own nipples, elbows, and cou-

plings to match. In fact, we're the only conduit manufacturer who does.

It's not surprising that Wheatland, of all conduit suppliers, has the expertise and resources to do the complete job. For Wheatland, as a major manufacturer of steel pipe, has developed the processes and techniques necessary to the production of quality tubular products.

Wheatland steel Rigid Metal Conduit, EMT and IMC meet all applicable provisions of the Underwriters Laboratories, the National Electrical Code, and the American National Standards Institute and Federal Specifications. This conformance to specifications is covered in detail on pages 3 to 12 and may be used as reference in submitting bids.

## Specialists In Steel Pipe

Wheatland Tube Company and affiliated companies manufacture steel tubular goods exclusively. Wheatland steel Rigid Metal Conduit, Electrical Metallic Tubing and Intermediate Metal Conduit are produced on the most modern equipment in the world. The smallest detail is given careful attention to assure you the high-

est standards of product quality. Wheatland steel Rigid Metal Conduit is widely known for the finest hot-dip galvanizing and hot-zinc-coated threads in the industry. A specially formulated coating inhibits oxidation. The galvanized coating is uniform and flake-proof. The conduit cuts, threads, and bends easily be-

cause of Wheatland's controlled processing.

Wheatland Electrical Metallic Tubing and Intermediate Metal Conduit are manufactured on modern electric resistance weld mills, galvanized in line, and sprayed with special coatings for ease of pulling wires and to inhibit white rust and storage stain.

## General Information

### Authority Having Jurisdiction (AHJ)

All jurisdictions responsible for electrical installations neither automatically adopt the current edition of the National Electrical Code® nor do they implement it uniformly. Therefore, it is good practice to check with the authority having jurisdiction for local interpretations of the rules and approval of equipment and materials before beginning installation.

### Other Articles and Sections of the National Electrical Code

The three NEC® 2005 Articles contained in this brochure specifically address the installation of electrical steel raceways produced by Wheatland. They represent

only a small segment of the code which may be amended by other Articles or Sections, depending on the installation. The safe installations of these raceways require that all applicable Articles and Sections of the code be observed.

The National Electrical Code® is published every three years. The next edition is due in 2008.

### Federal Specifications

The Federal government, in an effort to reduce costs, has undertaken a process of identifying non-government and industry-wide practices that have been accepted previously by the Department of Defense

under the Single Process Initiative (SPI) for use in lieu of a specific military or Federal Specification or standard. This process reduces the burden of the government to produce and maintain a separate standard.

- Federal agencies accept UL 6 where applicable to steel Rigid Metal Conduit and UL1242 where applicable to Intermediate Metal Conduit in lieu of WW-C-581.
- Federal agencies accept American National Standards Institute ANSI C80.3 and UL 797 where applicable to Electrical Metallic Tubing in lieu of WW-C-563.



## Electrical Metallic Tubing - (EMT)

### WEIGHTS AND DIMENSIONS

Trade Size	Metric Designator	Weight 10 Unit Lengths		Outside Diameter(1)		Inside Diameter(2)		Wall Thickness(2)	
		lb	kg	in.	mm	in.	mm	in.	mm
½	16	30	13.6	0.706	17.93	0.622	15.80	.042	1.07
¾	21	46	20.9	0.922	23.42	0.824	20.93	.049	1.24
1	27	67	30.4	1.163	29.54	1.049	26.64	.057	1.45
1¼	35	101	45.8	1.510	38.35	1.380	35.05	.065	1.65
1½	41	116	52.6	1.740	44.20	1.610	40.89	.065	1.65
2	53	148	67.1	2.197	55.80	2.067	52.50	.065	1.65
2½	63	216	98.0	2.875	73.03	2.731	69.37	.072	1.83
3	78	263	119.3	3.500	88.90	3.356	85.24	.072	1.83
3½	91	349	158.3	4.000	101.60	3.834	97.38	.083	2.11
4	103	393	178.3	4.500	114.30	4.334	110.08	.083	2.11

NOTES: (1) Outside diameter subject to UL 797 tolerances.  
(2) For information only, not a UL 797 requirement.

### PACKAGING

Trade Size	Metric Designator	Bundle Tape Color	Quantity Per Bundle		Quantity Per Lift				Weight Per Lift		Volume Per Lift	
			Feet	Meters	Pieces	Bundles	Feet	Meters	Pounds	Kilograms	Cu. Ft.	Cu. m
½	16	Black	100	30.5	—	70	7000	2134	2100	952.5	31.7	0.9
¾	21	Red	100	30.5	—	50	5000	1524	2300	1043.3	36.1	1.0
1	27	Blue	100	30.5	—	30	3000	914	2010	911.7	36.5	1.0
1¼	35	Red	50	15.2	—	40	2000	610	2020	916.3	38.2	1.1
1½	41	Black	50	15.2	—	30	1500	457	1740	789.3	37.9	1.1
2	53	—	—	—	120	—	1200	366	1776	805.6	46.7	1.3
2½	63	—	—	—	61	—	610	186	1318	597.8	41.5	1.2
3	78	—	—	—	51	—	510	155	1341	608.3	48.9	1.4
3½	91	—	—	—	37	—	370	113	1291	585.6	48.6	1.4
4	103	—	—	—	30	—	300	91	1179	534.8	50.0	1.4

## Use of Wheatland Electrical Metallic Tubing in Conformance to the 2005 National Electrical Code®

### Article 358

#### Electrical Metallic Tubing: Type EMT

#### I. General

**358.1 Scope.** This article covers the use, installation, and construction specifications for electrical metallic tubing (EMT) and associated fittings.

#### 358.2 Definition.

**Electrical Metallic Tubing (EMT).** An unthreaded thinwall raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed utilizing appropriate fittings. EMT is

generally made of steel (ferrous) with protective coatings or aluminum (nonferrous).

**358.6 Listing Requirements.** EMT, factory elbows, and associated fittings shall be listed.



## II. Installation

### 358.10 Uses Permitted.

**(A) Exposed and Concealed.** The use of EMT shall be permitted for both exposed and concealed work.

**(B) Corrosion Protection.** Ferrous or non-ferrous EMT, elbows, couplings, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, or in areas subject to severe corrosive influences where protected by corrosion protection and judged suitable for the condition.

**(C) Wet Locations.** All supports, bolts, straps, screws, and so forth shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials.

FPN: See 300.6 for protection against corrosion.

**358.12 Uses Not Permitted.** EMT shall not be used under the following conditions:

- (1) Where, during installation or afterward, it will be subject to severe physical damage
- (2) Where protected from corrosion solely by enamel
- (3) In cinder concrete or cinder fill where subject to permanent moisture unless protected on all sides by a layer of noncinder concrete at least 50 mm (2 in.) thick or unless the tubing is at least 450 mm (18 in.) under the fill
- (4) In any hazardous (classified) location except as permitted by 502.10, 503.10, and 504.20
- (5) For the support of luminaries (fixtures) or other equipment except conduit bodies no larger than the largest trade size of the tubing
- (6) Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action

*Exception: Aluminum fittings and enclosures shall be permitted to be used with steel EMT where not subject to severe corrosive influences.*

### 358.20 Size.

**(A) Minimum.** EMT smaller than metric designator 16 (trade size ½) shall not be used.

*Exception: For enclosing the leads of motors as permitted in 430.245 (B).*

**(B) Maximum.** The maximum size of EMT shall be metric designator 103 (trade size 4).

FPN: See 300.1(C) for the metric designators and trade sizes. These are for identification purposes only and do not relate to actual dimensions. [See page 7]

**358.22 Number of Conductors.** The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9. [See page 7]

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9. [See page 7]

**358.24 Bends - How Made.** Bends shall be made so that the tubing is not damaged and the internal diameter of the tubing is not effectively reduced. The radius of the curve of any field bend to the centerline of the tubing shall not be less than shown in Table 2, Chapter 9 for one-shot and full shoe benders. [See page 10]

**358.26 Bends - Number in One Run.** There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, for example, conduit bodies and boxes.

### 358.28 Reaming and Threading.

**(A) Reaming.** All cut ends of EMT shall be reamed or otherwise finished to remove rough edges.

**(B) Threading.** EMT shall not be threaded.

*Exception: EMT with factory threaded integral couplings complying with 358.100.*

**358.30 Securing and Supporting.** EMT shall be installed as a complete system in accordance with 300.18 and shall be securely fastened in place and supported in accordance with 358.30 (A) and (B).

**(A) Securely Fastened.** EMT shall be securely fastened in place at least every 3 m (10 ft). In addition, each EMT run between termination points shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other tubing terminations.

*Exception No. 1: Fastening of unbroken lengths shall be permitted to be increased to a distance of 1.5 m (5 ft) where structural members do not readily permit fastening within 900 mm (3 ft).*

*Exception No. 2: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of EMT shall be permitted to be fished.*

**(B) Supports.** Horizontal runs of EMT supported by openings through framing members at intervals not greater than 3 m (10 ft) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

### 358.42 Couplings and Connectors.

Couplings and connectors used with EMT shall be made up tight. Where buried in masonry or concrete, they shall be concretetight type. Where installed in wet locations, they shall comply with 314.15(A).

**358.56 Splices and Taps.** Splices and taps shall be made in accordance with 300.15.

**358.60 Grounding.** EMT shall be permitted as equipment grounding conductor.

## III. Construction Specifications

**358.100 Construction.** Factory-threaded integral couplings shall be permitted. Where EMT with a threaded integral coupling is used, threads for both the tubing and coupling shall be factory-made. The coupling and EMT threads shall be designed so as to prevent bending of the tubing at any part of the thread.

**358.120 Marking.** EMT shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21.





## Intermediate Metal Conduit - (IMC)

### WEIGHTS AND DIMENSIONS

Trade Size	Metric Designator	Threads Per Inch	Acceptable Length of Finished Conduit Without Coupling			Weight 10 Unit Lengths with Couplings		Nominal(1) Outside Diameter		Nominal(2) Inside Diameter		Nominal(1) Wall Thickness	
			ft.	in. (+/- ¼ in.)	mm (+/- 6 mm)	lb	kg	in.	mm	in.	mm	in.	mm
½	16	14	9	11¼	3030	62	28.12	0.815	20.70	0.660	16.76	.078	1.97
¾	21	14	9	11¼	3030	84	38.10	1.029	26.14	0.869	22.07	.083	2.10
1	27	11½	9	11	3025	119	53.98	1.290	32.77	1.105	28.07	.093	2.35
1¼	35	11½	9	11	3025	158	71.67	1.638	41.59	1.448	36.77	.095	2.41
1½	41	11½	9	11	3025	194	88.00	1.883	47.82	1.683	42.74	.100	2.54
2	53	11½	9	11	3025	256	116.12	2.360	59.93	2.150	54.60	.105	2.67
2½	63	8	9	10½	3010	441	200.04	2.857	72.57	2.557	64.95	.150	3.81
3	78	8	9	10½	3010	543	246.30	3.476	88.29	3.176	80.67	.150	3.81
3½	91	8	9	10¾	3005	629	285.31	3.971	100.86	3.671	93.24	.150	3.81
4	103	8	9	10¾	3005	700	317.52	4.466	113.44	4.166	105.82	.150	3.81

NOTES: (1) Figures are the average of the maximum and minimum dimensions as given in UL 1242.

(2) Calculated from nominal outside diameter and wall thickness.

### PACKAGING

Trade Size	Metric Designator	Thread Protectors Color	Quantity Per Bundle		Quantity Per Lift				Weight Per Lift		Volume Per Lift	
			Feet	Meters	Pieces	Bundles	Feet	Meters	Pounds	Kilograms	Cu. Ft.	Cu. m
½	16	Yellow	100	30.5	—	35	3500	1067	2170	984.3	26.4	0.7
¾	21	Green	50	15.2	—	50	2500	762	2100	952.5	33.5	0.9
1	27	Orange	50	15.2	—	34	1700	518	2023	917.6	32.1	0.9
1¼	35	Green	—	—	135	—	1350	411	2133	967.5	34.7	1.0
1½	41	Yellow	—	—	110	—	1100	335	2134	968.0	35.0	1.0
2	53	Orange	—	—	80	—	800	244	2048	929.0	30.9	0.9
2½	63	Yellow	—	—	37	—	370	113	1632	740.3	33.5	0.9
3	78	Orange	—	—	30	—	300	91	1629	738.9	38.3	1.1
3½	91	Yellow	—	—	24	—	240	73	1510	684.9	41.7	1.2
4	103	Orange	—	—	24	—	240	73	1680	762.0	48.6	1.4



## Use of Intermediate Metal Conduit In Conformance To The 2005 National Electrical Code®

### Article 342

### Intermediate Metal Conduit: Type IMC

#### I. General

**342.1 Scope.** This article covers the use, installation, and construction specifications for intermediate metal conduit (IMC) and associated fittings.

#### 342.2 Definition.

**Intermediate Metal Conduit (IMC).** A steel threadable raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed with its integral or associated couplings and appropriate fittings.

**342.6 Listing Requirements.** IMC, factory elbows and couplings, and associated fittings shall be listed.

#### II. Installation

#### 342.10 Used Permitted.

**(A) All Atmospheric Conditions and Occupancies.** Use of IMC shall be permitted under all atmospheric conditions and occupancies.

**(B) Corrosion Environments.** IMC, elbows, couplings, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, or in areas subject to severe corrosive influences where protected by corrosion protection and judged suitable for the condition.

**(C) Cinder Fill.** IMC shall be permitted to be installed in or under cinder fill where subject to permanent moisture where protected on all sides by a layer of noncinder concrete not less than 50 mm (2 in.) thick; where the

conduit is not less than 450 mm (18 in.) under the fill; or where protected by corrosion protection and judged suitable for the condition.

**(D) Wet Locations.** All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials.

FPN: See 300.6 for protection against corrosion.

**342.14 Dissimilar Metals.** Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action.

Aluminum fittings and enclosures shall be permitted to be used with IMC.

#### 342.20 Size.

**(A) Minimum.** IMC smaller than metric designator 16 (trade size ½) shall not be used.

**(B) Maximum.** IMC larger than metric designator 103 (trade size 4) shall not be used.

FPN: See 300.1(C) for the metric designator and trade sizes. These are for identification purposes only and do not relate to actual dimensions. [See page 7]

**342.22 Number of Conductors.** The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9. [See page 7]

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9. [See page 7]

**342.24 Bends - How Made.** Bends of IMC shall be so made that the conduit will not be

damaged and the internal diameter of the conduit will not be effectively reduced. The radius of the curve of any field bend to the centerline of the conduit shall not be less than indicated in Table 2, Chapter 9. [See page 10]

**342.26 Bends - Number in One Run.** There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, for example, conduit bodies and boxes.

**342.28 Reaming and Threading.** All cut ends shall be reamed or otherwise finished to remove rough edges. Where conduit is threaded in the field, a standard cutting die with a 1 in 16 (¾ in. taper per foot) shall be used.

FPN: See ANSI/ASME B.1.20.1-1983, *Standard for Pipe Threads, General Purpose (Inch)*.

**342.30 Securing and Supporting.** IMC shall be installed as a complete system in accordance with 300.18 and shall be securely fastened in place and supported in accordance with 342.30(A) and (B).

**(A) Securely Fastened.** Each IMC shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other conduit termination. Fastening shall be permitted to be increased to a distance of 1.5 m (5 ft) where structural members do not readily permit fastening within 900 mm (3 ft). Where approved, conduit shall not be required to be securely fastened within 900 mm (3 ft) of the service head for above-the-roof termination of a mast.

**(B) Supports.** IMC shall be supported in accordance with one of the following:

- (1) Conduit shall be supported at intervals not exceeding 3 m (10 ft).
- (2) The distance between supports for



straight runs of conduit shall be permitted in accordance with Table 344.30(B)(2), provided the conduit is made up with threaded couplings and such supports prevent transmission of stresses to termination where conduit is deflected between supports.

(3) Exposed vertical risers from industrial machinery or fixed equipment shall be permitted to be supported at intervals not exceeding 6 m (20 ft) if the conduit is made up with threaded couplings, the conduit is supported and securely fastened at the top and bottom of the riser, and no other means of intermediate support is readily available.

(4) Horizontal runs of IMC supported by openings through framing members at intervals not exceeding 3 m (10 ft) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

### 342.42 Couplings and Connectors.

**(A) Threadless.** Threadless couplings and connectors used with conduit shall be made tight. Where buried in masonry or concrete, they shall be the concretetight type. Where installed in wet locations, they shall comply with 314.15(A). Threadless couplings and connectors shall not be used on threaded conduit ends unless listed for the purpose.

**(B) Running Threads.** Running threads shall not be used on conduit for connection at couplings.

**342.46 Bushings.** Where a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect the wire from abrasion unless the design of the box, fitting, or enclosure is such as to afford equivalent protection.

FPN: See 300.4(F) for the protection of conductors 4 AWG and larger at bushings.

**342.56 Splices and Taps.** Splices and taps shall be made in accordance with 300.15.

**342.60 Grounding.** IMC shall be permitted as an equipment grounding conductor.

## III. Construction Specifications

**342.120 Marking.** Each length shall be clearly and durably marked at least every 1.5 m (5 ft) with the letters IMC. Each length shall be marked as required in 110.21.

**342.130 Standard Lengths.** The standard length of IMC shall be 3.05 m (10 ft), including an attached coupling, and each end shall be threaded. Longer or shorter lengths with or without coupling and threaded or unthreaded shall be permitted.

## From Article 300 Wiring Methods

**Table 300.1(C) Metric Designator and Trade Sizes**

Metric Designator	Trade Size
12	3/8
16	1/2
21	3/4
27	1
35	1 1/4
41	1 1/2
53	2
63	2 7/2
78	3
91	3 1/2
103	4
129	5
155	6

Note: The metric designators and trade sizes are for identification purposes only and are not actual dimensions.

## Chapter 9 Tables

**Table 1 Percent of Cross Section of Conduit and Tubing for Conductors**

Number of Conductors	All Conductor Types
1	53
2	31
Over 2	40

## Grounding Study on Steel EMT, IMC, and Rigid Conduit

After Article 250 was revised in the 1990 NEC®, the steel conduit producers initiated a program to evaluate the performance of steel EMT, IMC, and Rigid Metal Conduit during faults in secondary distribution systems.

Georgia Institute of Technology, Atlanta, GA undertook the research and in 1994

published their findings in a report that updated the grounding data developed by Eustace Soares, some 40 years ago, and answered the questions of compliance with NEC® Article 250.

- "Modeling and Testing of Steel EMT, IMC, and Rigid (GRC) Conduit" Study, Part I.

- Part II, Contains Appendices of Test Results.

You can download or view the study at, [www.steelconduit.org/free\\_downloads.htm](http://www.steelconduit.org/free_downloads.htm).



Hot-Dip Galvanized

## Rigid Metal Conduit - Steel (RMC)

### WEIGHTS AND DIMENSIONS

Trade Size	Metric Designator	Threads Per Inch	Acceptable Length of Finished Conduit Without Coupling			Weight 10 Unit Lengths with Couplings		Outside Diameter*		Inside Diameter*		Wall Thickness*	
			ft.	in. (+/- ¼ in.)	mm (+/- 6 mm)	lb	kg	in.	mm	in.	mm	in.	mm
½	16	14	9	11¼	3030	82	37.20	0.840	21.34	0.632	16.05	.104	2.64
¾	21	14	9	11¼	3030	109	49.44	1.050	26.67	0.836	21.23	.107	2.72
1	27	11½	9	11	3025	161	73.03	1.315	33.40	1.063	27.00	.126	3.20
1¼	35	11½	9	11	3025	218	98.88	1.660	42.16	1.394	35.41	.133	3.38
1½	41	11½	9	11	3025	263	119.30	1.900	48.26	1.624	41.25	.138	3.51
2	53	11½	9	11	3025	350	158.76	2.375	60.33	2.083	52.91	.146	3.71
2½	63	8	9	10½	3010	559	253.56	2.875	73.03	2.489	63.22	.193	4.90
3	78	8	9	10½	3010	727	329.77	3.500	88.90	3.090	78.49	.205	5.21
3½	91	8	9	10¼	3005	880	399.17	4.000	101.60	3.570	90.68	.215	5.46
4	103	8	9	10¼	3005	1030	467.21	4.500	114.30	4.050	102.87	.225	5.72
5	129	8	9	10	2995	1400	635.04	5.563	141.30	5.073	128.85	.245	6.22
6	155	8	9	10	2995	1840	834.62	6.625	168.28	6.093	154.76	.266	6.76

\*For information only, not a UL 6 requirement.

### PACKAGING

Trade Size	Metric Designator	Thread Protectors Color	Quantity Bundle		Quantity Per Lift				Weight Per Lift		Volume Per Lift	
			Feet	Meters	Pieces	Bundles	Feet	Meters	Pounds	Kilograms	Cu. Ft.	Cu. m
½	16	Black	100	30.5	—	25	2,500	762	2050	929.9	19.4	0.6
¾	21	Red	50	15.2	—	40	2,000	610	2180	988.8	26.7	0.8
1	27	Blue	50	15.2	—	25	1,250	381	2013	913.1	22.2	0.6
1¼	35	Red	—	—	90	—	900	274	1962	889.9	28.3	0.8
1½	41	Black	—	—	80	—	800	244	2104	954.4	27.2	0.8
2	53	Blue	—	—	60	—	600	183	2100	952.5	36.1	1.0
2½	63	Black	—	—	37	—	370	113	2068	938.0	35.0	1.0
3	78	Blue	—	—	30	—	300	91	2181	989.3	41.5	1.2
3½	91	Black	—	—	25	—	250	76	2200	997.9	43.3	1.2
4	103	Blue	—	—	20	—	200	61	2060	934.4	48.6	1.4
5	129	Blue	—	—	15	—	150	46	2100	952.5	52.1	1.5
6	155	Blue	—	—	10	—	100	30	1840	834.6	43.8	1.2





## Use of Wheatland Rigid Metal Conduit - Steel in Conformance to the 2005 National Electrical Code®

### Article 344

#### Rigid Metal Conduit: Type RMC

##### I. General

**344.1 Scope.** This article covers the use, installation, and construction specifications for rigid metal conduit (RMC) and associated fittings.

##### 344.2 Definition.

**Rigid Metal Conduit (RMC).** A threadable raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed with its integral or associated coupling and associated fittings. RMC is generally made of steel (ferrous) with protective coatings or aluminum (nonferrous). Special use types are silicon bronze and stainless steel.

**344.6 Listing Requirements.** RMC, factory elbows and couplings, and associated fittings shall be listed.

##### II. Installation

##### 344.10 Uses Permitted.

**(A) All Atmospheric Conditions and Occupancies.** Use of RMC shall be permitted under all atmospheric conditions and occupancies. Ferrous raceways and fittings protected from corrosion solely by enamel shall be permitted only indoors and in occupancies not subject to severe corrosive influences.

**(B) Corrosion Environments.** RMC, elbows, couplings, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, or in areas subject to severe corrosive influences where protected by corrosion protection and judged suitable for the condition.

**(C) Cinder Fill.** RMC shall be permitted to be installed in or under cinder fill where subject to permanent moisture where protected on all sides by a layer of noncinder concrete not less than 50 mm (2 in.) thick; where the conduit is not less than 450 mm (18 in.) under the fill; or where protected by corrosion protection and judged suitable for the condition.

**(D) Wet Locations.** All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials.

FPN: See 300.6 for protection against corrosion.

**344.14 Dissimilar Metals.** Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. Aluminum fittings and enclosures shall be permitted to be used with steel RMC, and steel fittings and enclosures shall be permitted to be used with aluminum RMC where not subject to severe corrosive influences.

##### 344.20 Size.

**(A) Minimum.** RMC smaller than metric designator 16 (trade size ½) shall not be used.

*Exception: For enclosing the leads of motors as permitted in Section 430.245 (B).*

**(B) Maximum.** RMC larger than metric designator 155 (trade size 6 ) shall not be used.

FPN: See 300.1(C) for the metric designators and trade sizes. These are for identification purposes only and do not relate to actual dimensions. [See page 7]

**344.22 Number of Conductors.** The number of conductors shall not exceed that permitted

by the percentage fill specified in Table 1, Chapter 9. [See page 7]

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed that allowable percentage fill specified in Table 1, Chapter 9. [See page 7]

**344.24 Bends - How Made.** Bends of RMC shall be so made that the conduit will not be damaged and so that the internal diameter of the conduit will not be effectively reduced. The radius of the curve of any field bend to the centerline of the conduit shall not be less than indicated in Table 2, Chapter 9. [See page 10]

**344.26 Bends - Number in One Run.** There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, for example, conduit bodies and boxes.

**344.28 Reaming and Threading.** All cut ends shall be reamed or otherwise finished to remove rough edges. Where conduit is threaded in the field, a standard cutting die with a 1 in 16 taper (¾-in. taper per foot) shall be used.

FPN: See ANSI/ASME B.1.20.1-1983, *Standard for Pipe Threads, General Purpose (Inch)*.

**344.30 Securing and Supporting.** RMC shall be installed as a complete system in accordance with 300.18 and shall be securely fastened in place and supported in accordance with 344.30(A) and (B).

**(A) Securely Fastened.** RMC shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other conduit termination. Fastening shall be permitted to be increased to a distance of 1.5 m (5 ft) where structural members do not readily permit fastening within 900 mm (3 ft). Where approved,



conduit shall not be required to be securely fastened within 900 mm (3 ft) of the service head for above-the-roof termination of a mast.

**(B) Supports.** RMC shall be supported in accordance with one of the following:

- (1) Conduit shall be supported at intervals not exceeding 3 m (10 ft)
- (2) The distance between supports for straight runs of conduit shall be permitted in accordance with Table 344.30(B)(2), provided the conduit is made up with threaded couplings and such supports prevent transmission of stresses to termination where conduit is deflected between supports.
- (3) Exposed vertical risers from industrial machinery or fixed equipment shall be permitted to be supported at intervals not exceeding 6 m (20 ft) if the conduit is made up with threaded couplings, the conduit is supported and securely fastened at the top and bottom of the riser, and no other means of intermediate support is readily available.
- (4) Horizontal runs of RMC supported by openings through framing members at intervals not exceeding 3 m (10 ft) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

## 344.42 Couplings and Connectors.

**(A) Threadless.** Threadless couplings and connectors used with conduit shall be made tight. Where buried in masonry or concrete, they shall be the concretetight type. Where installed in wet locations, they shall comply with 314.15(A). Threadless couplings and connectors shall not be used on threaded conduit ends unless listed for the purpose.

**Table 344.30(B)(2) Supports for Rigid Metal Conduit**

Conduit Size		Maximum Distance Between Rigid Metal Conduit Supports	
Metric Designator	Trade Size	m	ft
16 - 21	1/2 - 3/4	3.0	10
27	1	3.7	12
35 - 41	1 1/4 - 1 1/2	4.3	14
53 - 63	2 - 2 1/2	4.9	16
78 and larger	3 and larger	6.1	20

**(B) Running Threads.** Running threads shall not be used on conduit for connection at couplings.

**344.46 Bushings.** Where a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect the wire from abrasion unless the design of the box, fitting, or enclosure is such as to afford equivalent protection.

FPN: See 300.4(F) for the protection of conductors sizes 4 AWG and larger at bushings.

**344.56 Splices and Taps.** Splices and taps shall be made in accordance with 300.15.

**344.60 Grounding.** RMC shall be permitted as an equipment grounding conductor.

## III. Construction Specifications

**344.120 Marking.** Each length shall be clearly and durably identified in every 3 m (10 ft) as required in the first sentence of 110.21. Nonferrous conduit of corrosion-resistant material shall have suitable markings.

**344.130 Standard Lengths.** The standard length of RMC shall be 3.05 m (10 ft), including an attached coupling, and each end shall be threaded. Longer or shorter lengths with or without coupling and threaded or unthreaded shall be permitted.

## Need 20 Foot Lengths of Rigid or EMT?

Contact Wheatland Electrical sales department

E-mail: [info@wheatland.com](mailto:info@wheatland.com),

Phone : 800-257-8182, or Fax: 856-854-4973

## Chapter 9 Tables

**Table 2 Radius of Conduit and Tubing Bends**

Conduit or Tubing Size		One Shot and Full Shoe Benders		Other Bends	
Metric Designator	Trade Size	mm	in.	mm	in.
16	1/2	101.6	4	101.6	4
21	3/4	114.3	4 1/2	127	5
27	1	146.05	5 3/4	152.4	6
35	1 1/4	184.15	7 1/2	203.2	8
41	1 1/2	209.55	8 1/4	254	10
53	2	241.3	9 1/2	304.8	12
63	2 1/2	266.7	10 1/2	381	15
78	3	330.2	13	457.2	18
91	3 1/2	381	15	533.4	21
103	4	406.4	16	609.6	24
129	5	609.6	24	762	30
155	6	762	30	914.4	36



## Steel Conduit For EMI Solutions

Steel conduit will provide many benefits in your electrical distribution system. Steel conduit can dramatically reduce electromagnetic fields, thus reducing electromagnetic interference created by typical power frequency electrical wiring. Steel conduit systems can be designed for the best grounding. And steel conduit provides the well-known benefits of physical protection for conductors and fire safety.

### All New Grounding and ElectroMagnetic Interference (GEMI) Analysis Software

Developed specifically to assist architects, electrical engineers, electrical contractors, building and facility operation professionals with issues involving:

- Electromagnetic interference in electrical distribution systems

- Most effective conduit for electromagnetic field reduction
- Harmonics in electrical systems
- Design of distribution feeder and branch circuits for safety and economics
- Equipment grounding
- Easy and accurate calculation of conduit runs for effective grounding path
- Analysis of existing circuits

**GEMI** was researched, designed and written at the School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA.

The **GEMI** software program, which can be used to address the effects of EMI on commonly used electronic equipment, has been validated with actual measurements of EMF and the most exhaustive studies of impedance and permeability of steel conduit in 40 years.

**GEMI** permits flexibility in the design of a new system, comparison with other type systems designed to the equipment grounding requirements of the NEC, and analysis of existing systems to determine any upgrading necessary for safe ground fault interruption or reduced electromagnetic fields.

To obtain a copy of the **GEMI** software contact Wheatland's Marketing Department at [info@wheatland.com](mailto:info@wheatland.com). The software is free to qualified users.

## Wheatland Nipples, Elbows, and Couplings

Wheatland has a complete line of nipples, elbows, and couplings for Rigid steel and aluminum conduit, and elbows for steel IMC and EMT.

### Nipple, Elbow and Coupling Standards

The material standards that cover Wheatland's standard length conduit and

tubing cover our tubular fittings as well. As a convenience to our customers Wheatland inventories aluminum tubular fittings to ship with our steel fittings. Aluminum nipples, elbows and couplings conform to UL 6A, Federal Specification WW-C-540, and American National Standards Institute C80.5.

For complete information on weights, dimensions, and packaging ask for our product bulletins. Hot-dip Galvanized Rigid Conduit nipples, elbows and couplings are covered in one publication and Aluminum and IMC products in another.

## Electrical Metallic Tubing For Use Over 600 Volts

Underwriters Laboratories report *UL Report on Electrical Metallic Tubing For Use Over 600 Volts*, January 19, 1996 "identified Electrical Metallic Tubing (EMT) as suitable for use where the voltage be-

tween circuit conductors or between conductors and ground is over 600 volts."

For a copy of the UL report contact Wheatland's Marketing Department at [info@wheatland.com](mailto:info@wheatland.com).



## Applicable EMT Material Standards

Though the National Electrical Code® deals primarily with proper field application, it presumes that the tubing meets the standards necessary to perform properly under approved conditions. Wheatland Electrical Metallic Tubing is made to provide all the qualities required for proper installation as specified in the NEC®.

Wheatland Electrical Metallic Tubing is manufactured in conformance to standards established by the American National Standards Institute, the Underwriters Laboratories and the Federal Specifi-

cation. In preparing bids, it may be stated that Wheatland EMT Conforms to:

- Underwriters Laboratories Standard UL 797
- Federal Specification WW-C-563
- American National Standard Institute C80.3
- NEC® 2005 Section 250.118(4) recognizes EMT as an equipment grounding conductor.

## Applicable IMC Material Standards

Though the National Electrical Code® deals primarily with proper field application, it presumes that the conduit meets the standards necessary to perform properly under approved conditions. Wheatland Intermediate Metal Conduit is made to provide all the qualities required for proper installation as specified in the NEC®.

Wheatland Intermediate Metal Conduit is manufactured in conformance to standards established by the American National Standards Institute, the Underwriters Laboratories and the Federal Specifi-

cation. In preparing bids, it may be stated that Wheatland Intermediate Metal Conduit Conforms to:

- Underwriters Laboratories Standard UL 1242
- Federal Specification WW-C-581
- American National Standard Institute C80.6
- NEC® 2005 Section 250.118(3) recognizes IMC as an equipment grounding conductor.

## Applicable Rigid Metal Conduit - Steel Material Standards

Though the National Electrical Code® deals primarily with proper field application, it presumes that the conduit meets the standards necessary to perform properly under approved conditions. Wheatland galvanized steel Rigid Metal Conduit is made to provide all the qualities required for proper installation as specified in the NEC®.

Wheatland Galvanized steel Rigid Metal Conduit is manufactured in conformance to standards established by the American National Standards Institute, the Underwriters Laboratories and the Federal

Specification. In preparing bids, it may be stated that Wheatland Galvanized steel Rigid Metal Conduit Conforms to:

- Underwriters Laboratories Standard UL 6
- Federal Specification WW-C-581
- American National Standard Institute C80.1
- NEC® 2005 Section 250.118(2) recognizes RMC as an equipment grounding conductor.

### CORPORATE OFFICES:

Wheatland Tube Company  
900 Haddon Avenue  
Collingswood, NJ 08108-2162  
Phone: 800-257-8182  
Fax: 856-854-4973  
www.wheatland.com

### FACTORY INVENTORY LOCATIONS:

Wheatland Tube Company  
6247 Navigation Blvd.  
Houston, TX 77011  
Phone: 800-231-6345  
Fax: 713-928-8939

Wheatland Tube Company  
Chicago Division  
4435 South Western Blvd.  
Chicago, IL 60609-3024  
Phone: 773-254-0617  
Fax: 773-254-2244

Wheatland Tube Company  
Wheatland Division  
1 Council Avenue  
Wheatland, PA 16161-0608  
Phone: 724-342-6851  
Fax: 724-342-0294

Wheatland Tube Company  
200 Clark Street  
Sharon, PA 16146  
Phone: 724-347-7771  
Fax: 724-346-7199

Wheatland Tube Company  
Little Rock Division  
8200 Frazier Pike  
Little Rock, AR 72206-3811  
Phone: 800-831-5682  
Fax: 501-490-1011