Overview

Better by Design

Ocal® PVC-coated conduit and fittings represent a complete corrosion-protection package for your entire conduit system. This extensive product line includes the largest number of items in stock along with corrosion-resistant supports and patching compounds. With Ocal® PVC-coated conduit and fittings, you get corrosion protection that will extend the life of your electrical raceway system for years and years.

A Complete Corrosion Protection Solution

- UL® Listed with both the zinc coating and the PVC coating investigated and listed per UL6.
- Industry leading thread protection through a hot-dipped galvanizing process, and industry leading UL® Listed Type 4X PVC-coated conduit bodies.
- A full undisturbed zinc coating under the PVC coating, fulfilling the requirement of NEMA RN-1 regarding the restriction of harmed or eroded zinc coating over the conduit.
- Meets the requirements of NEMA RN-1 without exception.
- UL® Listed including UV resistance testing.
- "Double-Coat" coated fittings, enhancing corrosion protection by applying coating to the interior and exterior of the fittings before PVC coating.
- Custom colors.
- On-site installation training and certification, and extended warranty on installations conducted by certified installers.

Standards Met

- ANSI C80.1
- Federal Specification WW-C-581
- NEMA RN-1
- UL6

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Overview

What is corrosion?

Corrosive elements cause millions of dollars in damage through lost time, materials and labor.

Examples of Corrosion

Corrosion Protection of Electrical Conduit Systems

Corrosion Protection Options

CHEMICAL CATEGORY	CHEMICAL EXAMPLES	PVC	URETHANE	304 STAINLESS STEEL	316 STAINLESS STEEL	POLY CARBONATE	CAST IRON	BRASS	ALUMINUM
		COMPATIBILITY RATING							
Solvents (excluding alcohols and aliphatic)	Acetone, toluene, ketones, etc.	NR	NR	L	L	NR	L	L	L
Fuels	Jet fuel (alcohol based and aliphatic solvent based)	L	L	L	L	L	L	L	L
Plating Solutions	Chrome, nickel, copper, brass, gold, zinc, etc.	L	F	F	F	F	NR	NR	NR
Salts and Alkaline Materials	Caustic soda, caustic potash, alkaline cleaners, etc.	L	F	L	L	F	NR	NR	NR
Mild Acids	Low-concentration hydrochloric, sulfuric, fruit acids, glycolic, citric, etc.	L	S	L	L	S	NR	NR	NR
Strong or High-Purity Acids	Nitric, hydrofluoric, etc.	S	S	F	F	S	NR	NR	NR
Oxidizing Agents	Bleach, chlorine, hydrogen peroxide, etc.	L	S	L	L	S	NR	NR	NR

Chemical Compatibility Legend

SUITABILITY DESCRIPTION	COMPATIBILITY RATING
Rated for all **Fumes, Splash & Liquid**	L
Rated only for **Fumes & Splash**	S
Rated for **Fumes** only	F
Not Recommended	NR

The chart **above** provides a general guide for the end user to choose the most suitable material for corrosion protection. Compatibility with chemical environment should be thoroughly evaluated for each installation.

As you can see, PVC-coated conduit and fittings are suitable for almost all applications. When it comes to PVC-coated conduit systems, there is no higher quality than Ocal®.

Overview

Ocal manufacturing process

Introduction

The Ocal® PVC-coated conduit system fully complies with all standards for proper use and protection in corrosive environments mandated by UL6, NEMA RN-1 and ANSI C80.1. It is manufactured right here in the United States by Thomas & Betts in our Jonesboro, AR manufacturing facility.

The Process of Manufacturing PVC-Coated Conduit

1. The process begins with 20-foot sticks of raw steel shell.
2. The steel shell is cut, threaded and prepared for the hot-dip galvanizing process.
3. The threaded shell is immersed in a molten zinc bath. This hot-dip galvanizing process enables the zinc to penetrate the steel, providing the best possible protection. After the conduit is extracted from the zinc bath, super-heated steam is blown through the interior and over the outside of the conduit to remove any slag. The ends of the conduit are heated enough to blow excess zinc out of the thread cavities. Thomas & Betts manufactures steel conduit that hot-dip galvanizes the threads as well as the conduit itself. Other methods such as "hot galvanizing" provide only a sprayed-on zinc coating.
4. Prior to the exterior PVC coating, 2 mils (nominal) of blue urethane is applied to the inside diameter as well as the threads of each conduit. After priming, the conduit is heated and then rolled through liquid plastisol, achieving complete coverage of 40 mils in thickness.
5. Standard colors include gray, white and blue. Custom colors also available.

Ocal® offers

- Plant walk-throughs
- Installation training and certification
- Installation tools
- The expertise to ensure that you get the maximum benefit of the Ocal-Blue® total protection system
- Manufacturing capabilities that ensure unmatched delivery time on custom orders, special colors or large quantities
- Protection of each shipment with special packaging for damage-free delivery

Superior Service

Our reputation for dependability and customer service has made Ocal® the most trusted name in corrosion protection for the electrical industry.

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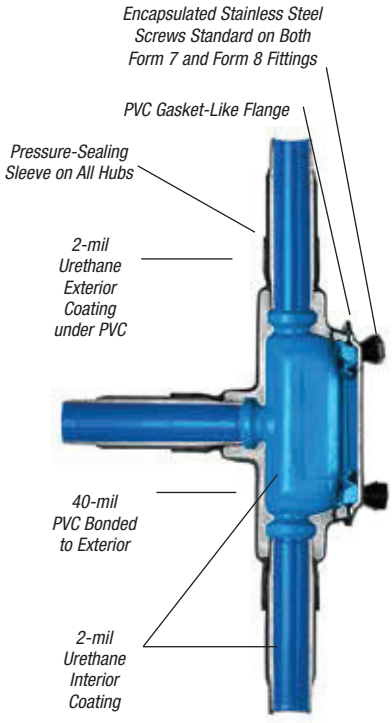
Overview

Complete corrosion protection

Ocal® has developed a process for coating the interior and exterior of all fittings with a nominal .002" (2 mils) of blue urethane, which is baked on. This proprietary application of urethane enhances the corrosion protection of your system, even if you accidentally nick or cut the PVC coating during installation.

Flexible, overlapping sleeves on all Ocal® fittings guarantee protection with a vapor- and moisture-tight seal at every connection.



Ocal supplies encapsulated screws on both Form 7 and Form 8 fittings.

The Process of Manufacturing PVC-Coated Fittings

1. Fittings are cleaned and then sprayed inside and outside with 2 mils (nominal) of blue urethane. This gives the fittings corrosion protection on the exterior as well as the interior — all fittings are "double-coated."
2. 40 mils of PVC is applied to the exterior of the fitting.
3. Covers are coated with a molded flange and molded integral O-ring seal for 2½" – 4" Form 8 and all Form 7. Conduit bodies are molded with a flat surface to ensure a superior seal.
4. Standard colors include gray, white and blue. Custom colors also available.

Thomas & Betts takes pride in providing PVC-coated conduit and fittings compliant with industry wide recognized standards.

It is this dedication to superior quality that makes Ocal "Better by Design."

NEW!

2" C Form 8 conduit body and cover

Ocal-Blue® Double-Coat UL® Listed Type 4X Form 8 Conduit Bodies

UL® Listed Type 4X and NEMA 4X!

For the conduit system that has to stand up to a corrosive environment, the newly designed Ocal-Blue® Type 4X Form 8 conduit body meets the challenge. The key is in the cover. Ocal® takes a cast cover and then injection molds a PVC coating around it with an integral O-ring seal.

There's no need for tools or gaskets. To meet the harsh requirements of the UL® Type 4X listing, you need only hand-tighten the stainless steel encapsulated screws to 15 in.-lbs. of torque — as compared to the 35 in.-lbs. of torque required to tighten cover screws on competitors' conduit bodies.

Ideal for providing corrosion-resistant performance in washdown and other tough applications, Ocal-Blue® Type 4X Form 8 PVC-coated cast-iron conduit bodies are now available in sizes up to 2". Look for the blue to know it's a high-quality Thomas & Betts product.

Overview

Evaluating corrosion protection of PVC-coated conduit

When evaluating any electrical raceway conduit or fittings, **applicable standards** should be referenced. The three standards that address the design and performance of PVC-coated rigid steel conduit are **ANSI C80.1, UL6 and NEMA RN-1**. ANSI C80.1, UL® and NEMA have determined the appropriate ASTM standards and test methods that apply.

Hot-Dip Galvanized Threads

Since electrical conduit systems breathe, the threads will be exposed to the corrosive environment for the duration of the installation. NEMA RN-1-2005 is the electrical industry's standard for PVC externally coated galvanized rigid steel conduit. Section 2.1 of this standard states, "Where unusually corrosive environments are encountered, it is recommended that threads be given additional protection suitable for the intended application." Hot-dip galvanizing is the process through which the steel shell is dipped in molten zinc, causing the zinc to penetrate the steel. Ocal® hot-dip galvanizes the threads of the conduit, in addition to the conduit itself. This gives the threads the protection recommended in corrosive environments.

A compelling demonstration of the protection hot-dip galvanizing provides is shown below, using a common corrosive agent, salt, on hot-dip galvanized threads. UL6, the standard for rigid metal conduit, references ASTM B117 for evaluating protective coatings. Below are the results of a salt-fog test using the standard test method ASTM B117.

Example of Hot-Dip Galvanized Threads after 42-day salt-fog test

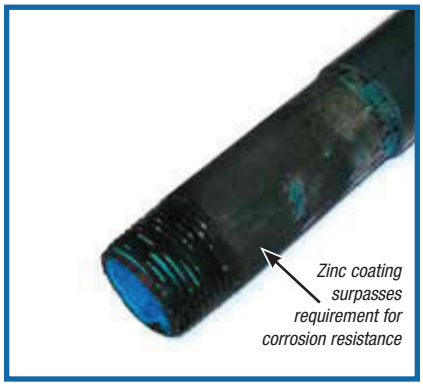
Galvanized conduit underneath the PVC coating — Preece Test

With so much riding on the integrity of their electrical conduit systems, facilities need the superior protection offered by the Thomas & Betts Ocal® PVC-coated conduit systems. The simple fact is that Ocal® PVC-coated conduit system complies fully with the design and performance standards for PVC-coated conduit set forth by UL6, NEMA RN-1 and ANSI C80.1.

ANSI C80.1, UL6 and NEMA RN-1 have determined the appropriate ASTM standards and test methods that apply, and the Preece test is one test that must be passed to be in full compliance.

Why is the Preece test relevant to PVC-coated conduit?

In cases where the PVC protection is accidentally breached, resulting from cuts, scrapes, etc., it is critical to have a second line of defense — a zinc, or galvanized, coating. The zinc coating will significantly slow corrosion and allow more time for repairs. Conduit systems without adequate zinc protection underneath the PVC coating are most likely to suffer catastrophic corrosion damage. This is why NEMA RN-1 section 3.1.1 requires the proper and correct treatment of galvanized conduit before it is PVC coated. It states, **"The surface shall be cleaned in such a manner that the galvanized surface of the conduit is not harmed or eroded."**



The purpose of the Preece test is to evaluate the zinc coating on galvanized rigid conduit to ensure adequate protection from corrosion per UL6.2.2. The test will also determine if the surface of the conduit has been damaged as a result of preparation for PVC coating.

In evaluating the test results, the conduit receives a passing grade when the sample does not show a bright, adherent deposit of copper after four 60-second immersions in the copper sulfate solution. The conduit showing the bright, firmly adhering copper has failed to provide adequate zinc protection against corrosion.

The Preece test follows procedures set forth by UL6.2.2 and ASTM A239 and is the test recognized by UL6, NEMA RN-1 and ANSI C80.1 to adequately assess zinc protection for rigid steel conduit. The Ocal® line of PVC-coated conduit systems, manufactured by Thomas & Betts, complies with UL6, NEMA RN-1 and ANSI C80.1 without exception.

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Adhesion test

The evaluation process for adhesion of PVC coating on conduit is governed by NEMA RN-1 section 3.8, Adhesion, which states, "The adhesion of the PVC coating to the conduit shall be greater than the strength of the coating itself." This adhesion test is straightforward and simple. There are no specialized conditions necessary to perform this test. Ocal® routinely performs quality-control testing — including the adhesion test — on conduit as it rolls off the line. Conduit that passes this test demonstrates that the adhesion will provide years of trouble-free service.

The following demonstration shows Ocal® PVC-coated conduit being subjected to the adhesion test.

Step 1 consists of two cuts through the plastic to the substrate along the length of the conduit, approximately ½" apart and 3" to 4" in length. A third, perpendicular cut crosses the lengthwise parallel cuts.

Step 2 calls for the edge of the PVC that was cut on the perpendicular to be carefully lifted to form a plastic tab.

In **Step 3**, the tab is pulled perpendicular to the conduit with a pair of pliers. The plastic tab will tear off rather than having any peeling effect or the coating separating from the substrate.

Step 4 is the evaluation of the test, which in this case, results in a passing grade for Ocal. This result is more testimony to the fact that Ocal is "Better by Design."

Results

With Ocal® PVC-coated conduit and fittings, you get corrosion protection that will extend the life of your electrical raceway systems for years and years.

PVC-Coated Conduit and Accessories

The ultimate in corrosion protection!

Ocal-Blue® Conduit

- Hot-dip galvanized steel or aluminum conduit
- Nominal .002" (2 mil) blue urethane coating on interior
- Hot-dipped galvanized threads (steel)
- Minimum .040" (40 mil) PVC coating on exterior — in your choice of blue, white, gray or custom colors
- Color-coded thread protectors
- Couplings shipped with conduit are packaged separately

CAT. NO.		PIPE SIZE IN. METRIC SIZE DESIGNATOR*	OUTSIDE DIAMETER STEEL ONLY IN. MM	OUTSIDE DIAMETER WITH PVC IN. MM	NOMINAL WALL THICKNESS STEEL ONLY IN. MM	NOMINAL WALL THICKNESS WITH PVC IN. MM	NOMINAL INSIDE DIAMETER IN. MM	CROSS SECTION AREA IN SQUARE IN. MM	LENGTH WITHOUT COUPLINGS FT. M	MINIMUM WEIGHT PER FOOT STEEL ONLY LBS. KG
STEEL	ALUMINUM									
COND1/2-_	**COND1/2SA-_**	**½**	**.84**	**.92**	**.10**	**.14**	**.63**	**.30**	**9'11¼"**	**.79**
		16	21.30	23.30	2.64	3.56	16.10	7.72	3.03	.36
COND3/4-_	**COND3/4SA-_**	**¾**	**1.05**	**1.13**	**.11**	**.15**	**.84**	**.53**	**9'11¼"**	**1.05**
		21	26.70	28.70	2.71	3.73	21.20	13.53	3.03	.48
COND1-_	**COND1SA-_**	**1**	**1.32**	**1.40**	**.13**	**.17**	**1.06**	**.86**	**9'11"**	**1.53**
		27	33.40	35.40	3.20	4.21	27.00	21.94	3.02	.69
COND1-1/4-_	**COND1-1/4SA-_**	**1¼**	**1.66**	**1.74**	**.13**	**.17**	**1.39**	**1.50**	**9'11"**	**2.01**
		35	42.20	44.10	3.37	4.39	35.40	37.97	3.02	.91
COND1-1/2-_	**COND1-1/2SA-_**	**1½**	**1.90**	**1.98**	**.14**	**.18**	**1.62**	**2.04**	**9'11"**	**2.40**
		41	48.30	50.20	3.50	4.52	41.20	51.71	3.02	1.09
COND2-_	**COND2SA-_**	**2**	**2.38**	**2.46**	**.15**	**.19**	**2.08**	**3.36**	**9'11"**	**3.32**
		53	60.30	62.30	3.70	4.72	52.90	85.21	3.02	1.51
COND2-1/2-_	**COND2-1/2SA-_**	**2½**	**2.88**	**2.96**	**.19**	**.23**	**2.49**	**4.80**	**9'10½"**	**5.27**
		63	73.00	75.00	4.90	5.91	63.20	121.61	3.01	2.39
COND3-_	**COND3SA-_**	**3**	**3.50**	**3.58**	**.21**	**.25**	**3.09**	**7.39**	**9'10½"**	**6.83**
		78	88.90	90.90	5.20	6.22	78.50	187.80	3.01	3.10
COND3-1/2-_	**COND3-1/2SA-_**	**3½**	**4.00**	**4.08**	**.22**	**.26**	**3.57**	**9.87**	**9'10¼"**	**8.31**
		91	101.60	103.60	5.46	6.47	90.70	250.60	3.00	3.77
COND4-_	**COND4SA-_**	**4**	**4.50**	**4.58**	**.23**	**.27**	**4.05**	**12.73**	**9'10¼"**	**9.73**
		103	114.30	116.30	5.71	6.73	102.90	323.34	3.00	4.41
COND5-_	**COND5SA-_**	**5**	**5.56**	**5.64**	**.25**	**.29**	**5.07**	**20.01**	**9'10"**	**13.14**
		129	141.30	143.30	6.22	7.23	128.90	508.15	3.00	5.96
COND6-_	**COND6SA-_**	**6**	**6.63**	**6.71**	**.27**	**.31**	**6.09**	**28.89**	**9'10"**	**17.46**
		155	168.30	170.30	6.75	7.87	154.80	733.83	3.00	7.92

Note *– Inches, feet and pounds are indicated in bold type. Metric measure is directly below bold type.*

** Metric size designator (ANSI C80.1-1994).*

CAT. NO.	SIZE	MATERIAL	COLOR
COND3/4		**___ -**	**___**
		Blank = Steel	**_ = space for color identifier**
		SA = Aluminum	**G** = Gray
			W = White
			B = Blue

Catalog No. Example:
COND3/4-G is ¾" steel conduit coated in gray PVC.

Custom colors also available.

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Plating Solutions	Chrome, nickel, copper, brass, gold, zinc, etc.	L	F	F	F	F	NR	NR	NR
Salts and Alkaline Materials	Caustic soda, caustic potash, alkaline cleaners, etc.	L	F	L	L	F	NR	NR	NR
Mild Acids	Low-concentration hydrochloric, sulfuric, fruit acids, glycolic, citric, etc.	L	S	L	L	S	NR	NR	NR
Strong or High-Purity Acids	Nitric, hydrofluoric, etc.	S	S	F	F	S	NR	NR	NR
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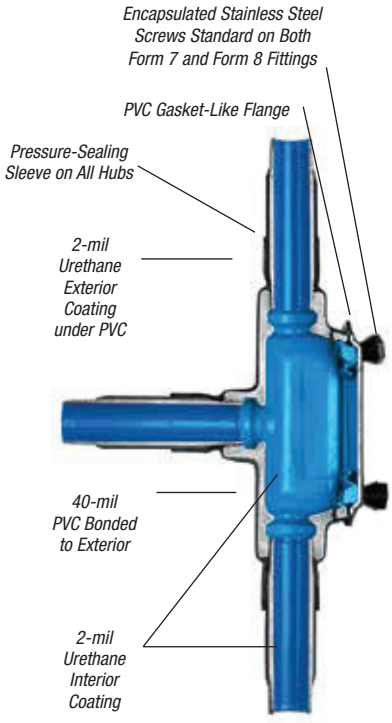

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Galvanized conduit underneath the PVC coating — Preece Test

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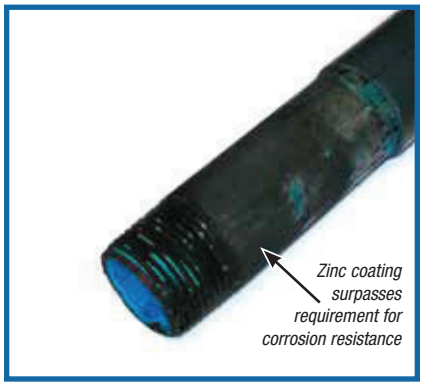
ANSI C80.1, UL6 and NEMA RN-1 have determined the appropriate ASTM standards and test methods that apply, and the Preece test is one test that must be passed to be in full compliance.

Why is the Preece test relevant to PVC-coated conduit?

In cases where the PVC protection is accidentally breached, resulting from cuts, scrapes, etc., it is critical to have a second line of defense — a zinc, or galvanized, coating. The zinc coating will significantly slow corrosion and allow more time for repairs. Conduit systems without adequate zinc protection underneath the PVC coating are most likely to suffer catastrophic corrosion damage. This is why NEMA RN-1 section 3.1.1 requires the proper and correct treatment of galvanized conduit before it is PVC coated. It states, **"The surface shall be cleaned in such a manner that the galvanized surface of the conduit is not harmed or eroded."**



The purpose of the Preece test is to evaluate the zinc coating on galvanized rigid conduit to ensure adequate protection from corrosion per UL6.2.2. The test will also determine if the surface of the conduit has been damaged as a result of preparation for PVC coating.

In evaluating the test results, the conduit receives a passing grade when the sample does not show a bright, adherent deposit of copper after four 60-second immersions in the copper sulfate solution. The conduit showing the bright, firmly adhering copper has failed to provide adequate zinc protection against corrosion.

The Preece test follows procedures set forth by UL6.2.2 and ASTM A239 and is the test recognized by UL6, NEMA RN-1 and ANSI C80.1 to adequately assess zinc protection for rigid steel conduit. The Ocal® line of PVC-coated conduit systems, manufactured by Thomas & Betts, complies with UL6, NEMA RN-1 and ANSI C80.1 without exception.

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Overview

Adhesion test

The evaluation process for adhesion of PVC coating on conduit is governed by NEMA RN-1 section 3.8, Adhesion, which states, "The adhesion of the PVC coating to the conduit shall be greater than the strength of the coating itself." This adhesion test is straightforward and simple. There are no specialized conditions necessary to perform this test. Ocal® routinely performs quality-control testing — including the adhesion test — on conduit as it rolls off the line. Conduit that passes this test demonstrates that the adhesion will provide years of trouble-free service.

The following demonstration shows Ocal® PVC-coated conduit being subjected to the adhesion test.

Step 1 consists of two cuts through the plastic to the substrate along the length of the conduit, approximately ½" apart and 3" to 4" in length. A third, perpendicular cut crosses the lengthwise parallel cuts.

Step 2 calls for the edge of the PVC that was cut on the perpendicular to be carefully lifted to form a plastic tab.

In **Step 3**, the tab is pulled perpendicular to the conduit with a pair of pliers. The plastic tab will tear off rather than having any peeling effect or the coating separating from the substrate.

Step 4 is the evaluation of the test, which in this case, results in a passing grade for Ocal. This result is more testimony to the fact that Ocal is "Better by Design."

Results

With Ocal® PVC-coated conduit and fittings, you get corrosion protection that will extend the life of your electrical raceway systems for years and years.

PVC-Coated Conduit and Accessories

The ultimate in corrosion protection!

Ocal-Blue® Conduit

- Hot-dip galvanized steel or aluminum conduit
- Nominal .002" (2 mil) blue urethane coating on interior
- Hot-dipped galvanized threads (steel)
- Minimum .040" (40 mil) PVC coating on exterior — in your choice of blue, white, gray or custom colors
- Color-coded thread protectors
- Couplings shipped with conduit are packaged separately

CAT. NO.		PIPE SIZE IN. METRIC SIZE DESIGNATOR*	OUTSIDE DIAMETER STEEL ONLY IN. MM	OUTSIDE DIAMETER WITH PVC IN. MM	NOMINAL WALL THICKNESS STEEL ONLY IN. MM	NOMINAL WALL THICKNESS WITH PVC IN. MM	NOMINAL INSIDE DIAMETER IN. MM	CROSS SECTION AREA IN SQUARE IN. MM	LENGTH WITHOUT COUPLINGS FT. M	MINIMUM WEIGHT PER FOOT STEEL ONLY LBS. KG
STEEL	ALUMINUM									
COND1/2-_	**COND1/2SA-_**	**½**	**.84**	**.92**	**.10**	**.14**	**.63**	**.30**	**9'11¼"**	**.79**
		16	21.30	23.30	2.64	3.56	16.10	7.72	3.03	.36
COND3/4-_	**COND3/4SA-_**	**¾**	**1.05**	**1.13**	**.11**	**.15**	**.84**	**.53**	**9'11¼"**	**1.05**
		21	26.70	28.70	2.71	3.73	21.20	13.53	3.03	.48
COND1-_	**COND1SA-_**	**1**	**1.32**	**1.40**	**.13**	**.17**	**1.06**	**.86**	**9'11"**	**1.53**
		27	33.40	35.40	3.20	4.21	27.00	21.94	3.02	.69
COND1-1/4-_	**COND1-1/4SA-_**	**1¼**	**1.66**	**1.74**	**.13**	**.17**	**1.39**	**1.50**	**9'11"**	**2.01**
		35	42.20	44.10	3.37	4.39	35.40	37.97	3.02	.91
COND1-1/2-_	**COND1-1/2SA-_**	**1½**	**1.90**	**1.98**	**.14**	**.18**	**1.62**	**2.04**	**9'11"**	**2.40**
		41	48.30	50.20	3.50	4.52	41.20	51.71	3.02	1.09
COND2-_	**COND2SA-_**	**2**	**2.38**	**2.46**	**.15**	**.19**	**2.08**	**3.36**	**9'11"**	**3.32**
		53	60.30	62.30	3.70	4.72	52.90	85.21	3.02	1.51
COND2-1/2-_	**COND2-1/2SA-_**	**2½**	**2.88**	**2.96**	**.19**	**.23**	**2.49**	**4.80**	**9'10½"**	**5.27**
		63	73.00	75.00	4.90	5.91	63.20	121.61	3.01	2.39
COND3-_	**COND3SA-_**	**3**	**3.50**	**3.58**	**.21**	**.25**	**3.09**	**7.39**	**9'10½"**	**6.83**
		78	88.90	90.90	5.20	6.22	78.50	187.80	3.01	3.10
COND3-1/2-_	**COND3-1/2SA-_**	**3½**	**4.00**	**4.08**	**.22**	**.26**	**3.57**	**9.87**	**9'10¼"**	**8.31**
		91	101.60	103.60	5.46	6.47	90.70	250.60	3.00	3.77
COND4-_	**COND4SA-_**	**4**	**4.50**	**4.58**	**.23**	**.27**	**4.05**	**12.73**	**9'10¼"**	**9.73**
		103	114.30	116.30	5.71	6.73	102.90	323.34	3.00	4.41
COND5-_	**COND5SA-_**	**5**	**5.56**	**5.64**	**.25**	**.29**	**5.07**	**20.01**	**9'10"**	**13.14**
		129	141.30	143.30	6.22	7.23	128.90	508.15	3.00	5.96
COND6-_	**COND6SA-_**	**6**	**6.63**	**6.71**	**.27**	**.31**	**6.09**	**28.89**	**9'10"**	**17.46**
		155	168.30	170.30	6.75	7.87	154.80	733.83	3.00	7.92

Note *– Inches, feet and pounds are indicated in bold type. Metric measure is directly below bold type.*

** Metric size designator (ANSI C80.1-1994).*

CAT. NO.	SIZE	MATERIAL	COLOR
COND3/4		**___ -**	**___**
		Blank = Steel	**_ = space for color identifier**
		SA = Aluminum	**G** = Gray
			W = White
			B = Blue

Catalog No. Example:
COND3/4-G is ¾" steel conduit coated in gray PVC.

Custom colors also available.

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