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

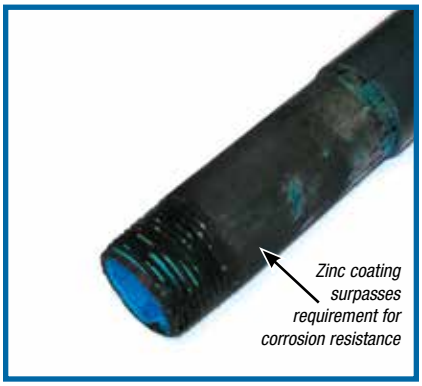
Galvanized conduit underneath the PVC coating — Preece Test

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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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. STEEL	CAT. NO. ALUMINUM	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
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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