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STANDARDS

ENGINEERING COMMITTEE
Interface Practices Subcommittee

SCTE STANDARD

SCTE 178 2019

Test Method for Cable Weld Integrity

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1. Introduction

1.1. Scope

This test procedure provides methods for evaluating and determining defects along the welded seam of coaxial cables whose outer conductor shield is constructed of a welded, aluminum or copper strip. This procedure may be used to inspect finished coaxial cable's outer conductor; either smooth or corrugated.

Note: For instances where the bond of the dielectric to outer metallic sheath is too aggressive for removal, a cone-expansion test method section 5.0 is offered as an alternative.

1.2. Benefits

The use of these techniques will provide a standardized method to properly evaluate welded, seam coaxial cable performance. It will also provide a standard means of making comparisons between the performance of various coaxial cable manufacturers.

1.3. Intended Audience

The intended audience for this specification, are manufactures, evaluation laboratories, and end-users with proper laboratories and equipment to perform this test described therein.

1.4. Areas for Further Investigation or to be Added in Future Versions

At this time, there are no considerations being giving for further investigation.

2. Normative References

The following documents contain provisions, which, through reference in this text, constitute provisions of this document. At the time of Subcommittee approval, the editions indicated were valid. All documents are subject to revision; and while parties to any agreement based on this document are encouraged to investigate the possibility of applying the most recent editions of the documents listed below, they are reminded that newer editions of those documents might not be compatible with the referenced version.

2.1. SCTE References

- No normative references are applicable.

2.2. Standards from Other Organizations

- No normative references are applicable.

2.3. Published Materials

- No normative references are applicable.

3. Informative References

The following documents might provide valuable information to the reader but are not required when complying with this document.

3.1. Standards from Other Organizations

- No informative references are applicable.

3.2. Published Materials

- No informative references are applicable.

4. Compliance Notation

shall	This word or the adjective "***required***" means that the item is an absolute requirement of this document.
shall not	This phrase means that the item is an absolute prohibition of this document.
forbidden	This word means the value specified shall never be used.
should	This word or the adjective "*recommended*" means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
should not	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
may	This word or the adjective "*optional*" means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.
deprecated	Use is permissible for legacy purposes only. Deprecated features may be removed from future versions of this document. Implementations should avoid use of deprecated features.

5. Abbreviations and Definitions

5.1. Abbreviations

5.2. Definitions

6. Equipment

The following equipment is needed in order to perform the weld integrity test with dye penetrant. In some instances, a manufacturer or part number may be provided for example or reference. This does not exclude the use of equivalent materials from alternative suppliers. See equipment listed below.

- Coaxial cable cutters, Jacket removal tool, or utility knife
- Shop cloths or cotton rags / towels
- Band or Scroll saw

- Solvent / Degreaser (example - Magaflux® Spotcheck® SKC-S Cleaner / Remover or equivalent)
- Penetrant (example - Magaflux® Spotcheck® SKL-SP1 Penetrant or equivalent)
- Developer (example - Magaflux® Spotcheck® SKD-S2 Developer or equivalent)
- Vented fume hood or a well-ventilated work area
- Arbor Press or Compression Tester
- Expansion Cones (Specific diameters / angles for finished cable sizes – See appendix)
- Cable Preparation / Coring Tools

Note: Carefully read and review all instructions with the chemical agents, assuring that safety precautions are observed and followed.

7. Dye Penatrant Method

7.1. Sample Preparation

- Obtain the necessary welded outer conductor cable samples as required. Sample length should be a minimum of 18 inches (457 mm)
- Provide a smooth, flush cut on each end of the sample, using a scroll or band saw.
- Place end-cap on end or seal via alternative method to prevent dye penetrant from compromising the sample(s) from the cut ends.
- Ensure outer surface of samples are free from foreign materials, paint, grease, oils, etc.
- Pre-clean samples by liberally applying solvent / cleaner; i.e. SKC-S Cleaner / Remover. Repeat this step and dry thoroughly with a clean cloth as shown in Figure 1.

7.2. Test Procedure

1. Apply penetrant liberally to the outer conductor surface ensuring the weld seam is coated. The penetrant can be applied via spray or brush. If penetrant pulls back into droplets, re-clean or wipe with solvent / cleaner and repeat application of penetrant.
2. Allow penetrant to remain on part for a minimum of 5 minutes, 10 minutes maximum. Extended exposure to the penetrant will not affect the results.
3. After sufficient time has been allowed, gently wipe the penetrant from the outer surface of the samples with a clean cloth or towel as seen in Figure 2. Remove excess surface penetrant with clean cloth, pre-moistened with the solvent / cleaner. DO NOT flush the surface with the cleaner. This will alter the results of the test.
4. After samples has been cleaned, using a band or scroll saw, cut sample approximately in half along the longitudinal axis of the cable. Ensure that the cut is relatively 90° perpendicular to the weld seam Remove the dielectric from the half of the sample which contains the weld seam. Care should be taken to not place unnecessary stress on the weld area as shown in Figure 3. Some cables that are bonded more aggressively than others may require a heat gun to remove the dielectric from the weld seam to keep from placing unnecessary stress and flex to the sample weld area
5. Shake the developer spray can vigorously until the agitators rattle inside, or thoroughly stir bulk developer. Spray the inside portion of the weld seam with Spotcheck® Developer, just enough to wet the part thinly and evenly, no more. Proper thickness will dry to a thin white layer. Too much developer will mask indications; too little will not develop the indication sufficiently. For ease of application, hold the spray can or bottle 8 to 12 inches above the part and spray short sections at a time. Allow 10 minutes minimum for the developer to dry as shown in Figure 5.

7.3. Inspection

After samples have thoroughly dried, visually inspect for evidence of red penetrant on the inner surface of the outer conductor. Place two marks 12 inches apart within the 18-inch prepared sample length. Record the type of penetrant evidence and the number of dots or lines within the marked 12-inch section. A line or dotted line marks a crack. A dot is an indication of porosity, shrinkage, lack of bond, or pinhole.

Record the type of penetrant evidence within the sample length, and number each for samples tested.

8. Photos Of Test Stages

Figure 1 - Samples Prepared for Testing

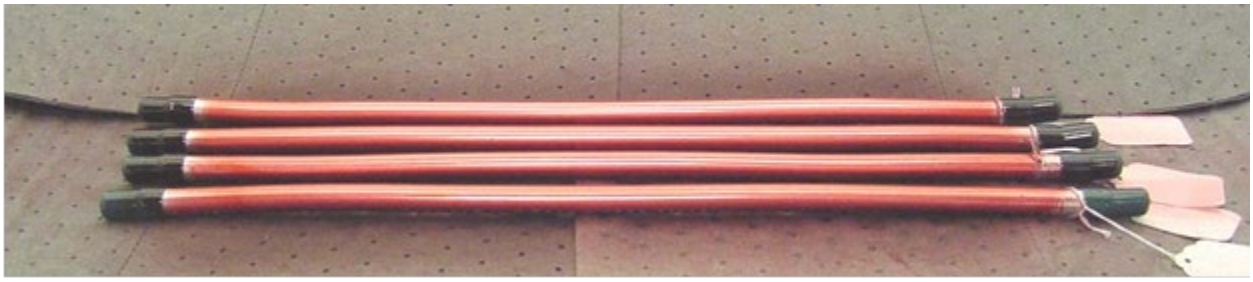

Figure 2 - Samples with Penetrant Applied

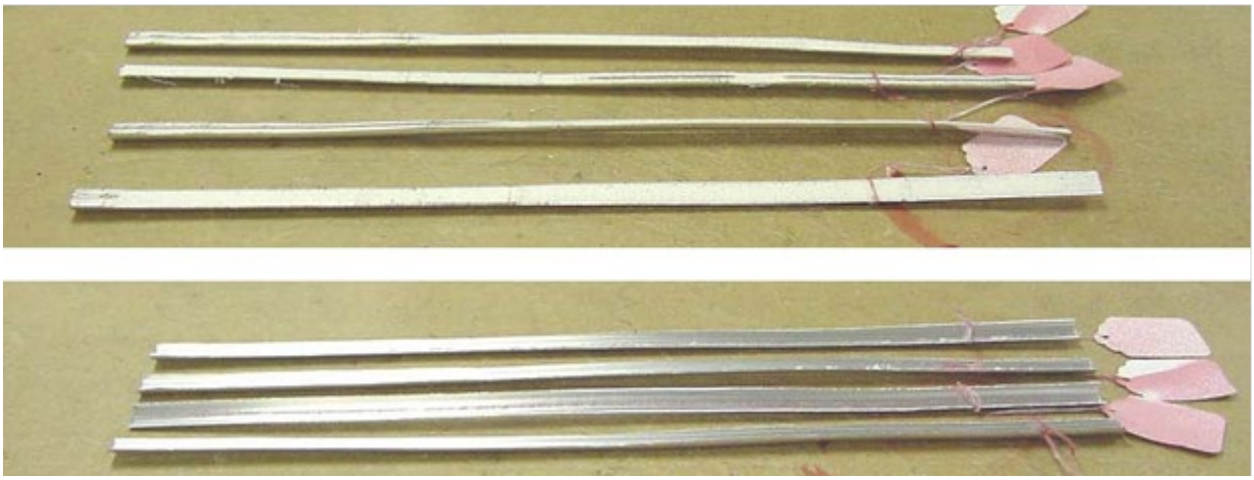

Figure 3 - Samples cut in half and with dielectric removed

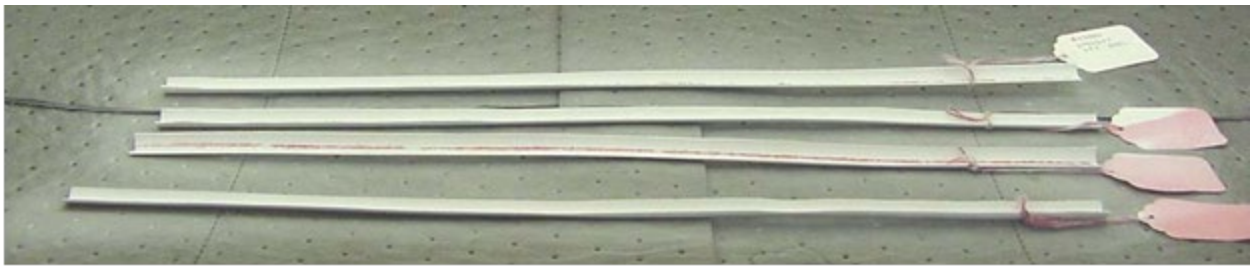

Figure 4 - Samples developer applied

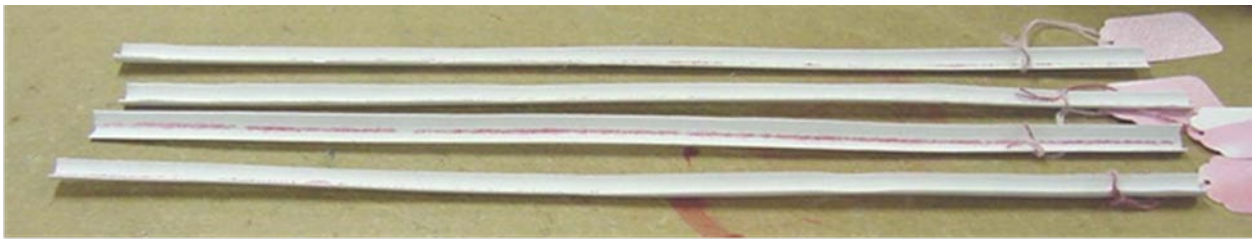

Figure 5 - Samples ready for inspection

9. Cone Expansion Test Method

9.1. Sample Preparation

Obtain the necessary welded outer conductor cable samples as required. Sample length should be a minimum of 12 inches (305 mm)

Provide a smooth, flush cut on each end of the sample, using a scroll or band saw.

Remove outer jacket, floodants, and dielectric as if preparing for connector installation. Ensure a minimum of 1inch of the outer conductor is fully exposed. (without jacket or dielectric)

Remove excess cable from other end with saw, remaining sample for testing shall be 4 ± 0.5 inches.

9.2. Test Procedure

1. Place expansion cone for the cable diameter under test, on the anvil of the arbor or bottom plate of the compression device as shown in Figure 7.
2. Place end of sample to be tested over the entry portion of the expansion cone. Sample is to remain vertical and perpendicular to the vertical axis of the expansion cone as shown in Figure 8.
3. Slowly bring the traveling member of the arbor press or compression tester upon the flush-cut end of the sample.
4. Gradual and increasing pressure is applied until the sample inner diameter (ID) has expanded to 15 percent of the initial ID or the outer conductor/weld has split.
5. Record location of the split of the outer conductor; i.e. Along the weld seam or area not along the weld seam.

10. Expansion Cone Pictures

Figure 6 - Mechanical Arbor Press

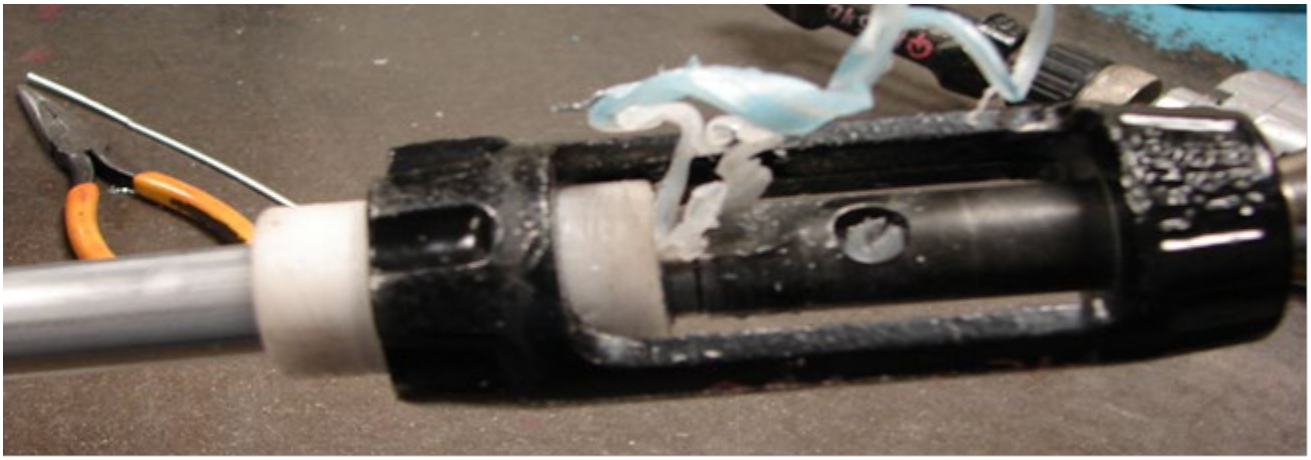

Figure 7 - Core Strip

Figure 8 - Cone Expansion

Figure 9 - Fifteen percent expansion

Table 1 - Weld Integrity Inspection Test

Weld Integrity Inspection Test -			**Date**	
Manufacturer			**Cable Type**	
Test Method				
sample number	**splits**	**porosity**	**comments**	
1				
2				
3				
4				
5				
Test performed by:				