COMMSCOPE®

QUALIFICATION TEST REPORT
CABLE, POWER, UNDERCARPET, TYPE FCC

501-309 Rev. A

Product Specification:	CSA-C22.2
ACL No.:	ACL 1260 269,270
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Classification:	Unrestricted
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Corporate Test Laboratory
COMMSCOPE, INC. OF NORTH CAROLINA

Table of Contents

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CORPORATE TEST LABORATORY

Qualification Test Report

1. Introduction

1.1 Purpose

Testing was performed on Flat,Type FCC Undercarpet Power Cable to determine its conformance to the requirements of CSA - C22.2 No.222 Second Edition, October 1994. Underwriters Laboratories performed the Flame Test (CSA 6.3.4) file E73212. Canadian Standards Association performed the Flame Test on the Bottom Shield (CSA 6.4) file LR 7189-A-652.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the Flat, Type FCC Undercarpet Power Cable manufactured by the Business Wiring Systems Unit of the Utility, Networking and Communications Business Group.The testing was performed at the Automotive/Consumer Group Test Laboratory between 2-13-95 and 5-25-95. Test results of the above mentioned, including UL and CSA Testing may be obtained from file ACL1260 269 and ACL1260 270.

1.3 Conclusion

The Flat, Type FCC Undercarpet Power Cable does, in COMMSCOPE'S point of view meets the electrical, mechanical, and environmental performance requirements of the requested tests of the CSA - C22.2 No.222 Second Edition, October 1994 Specification.

1.4 Product Description

The Flat, Type FCC Undercarpet Power Cable was designed to be installed underneath carpet squares with release-type adhesives. The cable is manufactured with 3 or 5 flat conductors in 12 AWG and 10 AWG with thermoplastic insulation. The complete cable assembly includes a Top Plate Shield, Upper and Lower polyvinyl moisture barrier (blue), a polyvinyl Floor Preparation (yellow), Transition Block Assembly, Spring Clips, DCR (Direct Connecting Receptacle), Hold Down Mounting Tape and the Undercarpet Power Cable.

1.5 Test Samples

The test samples were randomly selected from normal current production lots, and the following part numbers were used for test:

Part Nbr	Description
3-553079-3	3-Conductor 12 AWG Under Carpet Cable
3-553445-3	3-Conductor 10 AWG Under Carpet Cable

Note: Samples were cut and stripped to various lengths per each test requirement.

1.6 Tests Performed

	Pass/Fail		
Tests per CSA-C22.2 No.222	12 AWG		10 AWG
Heat Resistance Properties Test (6.3.1)	Pass		Pass
Deformation Test (6.3.2)	Pass		Pass
Cold Bend Test (6.3.3)	Pass		Pass
Flame Test (6.3.4) per UL Test File	Pass		Pass
Impact Test (6.3.5)	Pass		Pass
Overload Current Test (6.3.6)	Pass		Pass
Dielectric Strength Test (6.3.7)	Pass		Pass
Insulation Resistance Test (6.3.8)	Pass		Pass
Spark Test (6.3.9)	Pass		Pass
Flame Test on Bottom Vinyl Shield (6.4) per CSA Test File LR 7189-A-652	Pass		Pass
Insulating Materials Test (6.5)	Pass		Pass
Material Degradation Test (6.6.5)	Pass		Pass
Fault Penetration Test (6.6.6)	Pass		Pass
Ground Fault Test (6.6.7)	Pass		Pass

2. Summary of Testing

All samples submitted for testing were selected from normal current production lots. They were inspected and accepted by the Product Assurance Department of the Utility, Networking and Communications Business Group.

2.1 Heat Resistance Properties Test (CSA 6.3.1)

After exposure to 100°C for 7 days and two folding cycles the conductors of both the 12 AWG and 10 AWG test specimens showed no conductor breaks and the conductor insulation showed no insulation splits, insulation separation or cracking when viewed under 3x magnification. The test specimens withstood 1500 volts AC for 1 minute while immersed in tap water for 1 hour. The measurements were taken between the conductors and tap water at the fold

2.2 Deformation Test (CSA 6.3.2)

The thickness of the conductor insulation on both the 12 AWG and 10 AWG test specimens did not decrease more than 50% in thickness when exposed to 121°C for 1 hour under a 500 gram load.

2.3 Cold Bend Test (CSA 6.3.3)

The conductor insulation of both the 12 AWG and 10 AWG test specimens showed no cracks while being bent 180 degrees during -18°C exposure for 1 hour. Both test specimens also withstood 1500 volts AC for 1 minute while immersed in tap water for 1 hour between the conductors and water and between all conductors.

2.4 Flame Test (CSA 6.3.4)

This test was performed by Underwriters Laboratories, Inc.. According to their report file No. E73212 all test specimens met their requirement.

2.5 Impact Test (CSA 6.3.5)

After 7 days of 100°C exposure, the conductor insulation of both 12 AWG and 10 AWG test specimens showed no cracks while being impacted with 5.42 N-m at 25°C. Afterwards, Both specimens also withstood 1500 volts AC for 1 minute while immersed in tap water between the conductors and water and between the conductors.

The Impact Test was also performed to unaged test specimens (12 AWG and 10 AWG) during exposure to -18°C for 1 hour. No insulation cracks were evident on either test specimen and both test specimens withstood 1500 volts AC for 1 minute while immersed in tap water.

2.6 Overload Current Test (CSA 6.3.6)

Both the 12 AWG and 10 AWG test specimens withstood 1500 volts AC for 1 minute between the insulated conductors and the grounding conductor connected to the top shield after being overloaded with each specimen's respective current for 15 minutes.

2.7 Dielectric Strength Test (CSA 6.3.7)

Both the 12 AWG and 10 AWG test specimens withstood 1500 volts AC for 1 minute after being immersed in tap water for 6 hours.

2.8 Insulation Resistance Test (CSA 6.3.8)

The Insulation Resistance measurements taken Immediately after the Dielectric Strength Test, while still immersed in tap water, were greater than 22 Gigaohms.

2.9 Spark Test (CSA 6.3.9)

Both the 12 AWG and 10 AWG test specimens withstood the 3000 volts AC surge at 500 volts AC per second rate of rise.

2.10 Flame Test on Nonmetallic Material for Bottom Shields (CSA 6.4)

This test was performed by the Canadian Standards Association (CSA). According to their test file report, LR 7189-A-652, the yellow, pvc bottom shield (P/N 554123-1) met their eligibility requirements.

2.11 Insulating Material used as Conductor Insulation (CSA 6.5)

Both the 12 AWG and 10 AWG test specimens withstood the 1500 Volts AC for 1 minute at 500 volts AC per second rate of rise after being exposed to 100°C for 7 days. No Dielectric breakdowns occurred.

2.12 Material Compatibility and Degradation Tests (CSA 6.6.5)

Both the 12 AWG and 10 AWG test specimens withstood the 1500 Volts AC for 1 minute at a rate of 500 Volts AC per second rate of rise after being exposed to their respective test environments. No Dielectric breakdowns occurred.

2.13 Fault Penetration Test (CSA 6.6.6)

Both the 20 amp fuse (12 AWG) and the 30 amp fuse (10 AWG) did blow during penetration while energized and nonenergized. The penetration points included each of the 3 conductors laying flat and the 3 conductors folded 90 degrees penetrating 2 conductors at a time.

2.14 Ground Fault Test (CSA 6.6.7)

After two applications of 470 amps on the 12 AWG specimen and 750 amps on the 10 AWG specimen for a 4 second period no electrical discontinuities were detected.

3. Test Methods

3.1 Heat Resistance Properties Test (CSA 6.3.1)

Straight test specimens (400mm long) of 12 AWG and 10 AWG were exposed to 100°C for 7 days. After removal from the heat the test specimens were allowed to cool down to 25°C then subjected to two 45 degree folds. After examining for conductor breaks and insulation splits at 3x magnification the test specimens, still folded were submerged in tap water for 1 hour, after which dielectric withstand voltage was measured between the insulated conductors and tap water.
Note: After the cable fold was performed by hand it was placed between metal plates along with a metal shim 3 times the nominal thickness of the cable and placed beside the fold. A load of 22.2 kN was applied for 15 minutes. The cable was removed and straightened, thus constituting 1 cycle of folding.

3.2 Deformation Test (CSA 6.3.2)

The insulated conductor test specimen (400mm long) was placed flat between two metal plates with 500 grams of force applied to the plates and placed in a heat oven for 1 hour at 121°C.

3.3 Cold Bend Test (CSA 6.3.3)

A 500mm long, 3- conductor test specimen was exposed to -18°C for 1 hour. After 1 hour and while still exposed to -18°C the specimen was bent 180 degrees over the edge of a piece of 1.6mm thick steel with a semicircular edge. The specimen was then removed from the cold chamber and examined for insulation cracks. Next, the specimen was placed in tap water and dielectric withstand was measured between the conductors and water and between each adjacent conductor.

3.4 Flame Test (CSA 6.3.4)

According to the Underwriters Laboratory, Inc. testing was performed per UL 1581.

3.5 Impact Test (CSA 6.3.5)

After conditioning the 500mm long test specimens at 100°C for 7 days, the specimens were impacted with a 1.36 kg mass dropped 403mm at 25°C. The specimen was oriented in a flat configuration. The specimens were examined at 3x magnification for insulation cracks. Specimens were then immersed in tap water for 1 hour before dielectric withstand was measured between the conductors and water and between each adjacent conductor.
A second set of test specimens were conditioned at -18°C for 1 hour with the same impact and measurements taken as with the above heat aged specimens.

3.6 Overload Current (CSA 6.3.6)

After installing the complete undercarpet cable system under carpet squares on an unsanded plywood floor the 12 AWG and 10 AWG conductors were energized with a high current level for 15 minutes. **53 amps for 12 AWG** and **80 amps for 10 AWG**. Dielectric withstand measurements were taken between the insulated conductors and the grounding conductor connected to the top shield after the cable system was deenergized and allowed to cool down for 12 hours.

3.7 Dielectric Strength Test (CSA 6.3.7)

While still immersed, dielectric withstand was performed on an unaged test specimen 3m in length after being immersed in tap water for 6 hours. Measurements were taken between the conductors and water and between each adjacent conductor.

3.8 Insulation Resistance Test (CSA 6.3.8)

Immediately following the dielectric withstand test and still immersed in 21°C tap water, insulation resistance measurements were taken between the insulated conductors and water and between each adjacent insulated conductor.
Note: Electrification time was 3 minutes.

3.9 Spark Test (CSA 6.3.9)

With the complete cable system in place under carpet squares and laying flat on an unsanded plywood floor, AC Voltage was applied at a rate of 500 volts AC per second between adjacent conductors 1 and 2 and conductors 2 and 3 until a voltage breakdown occurred.

3.10 Flame Test on Nonmetallic Material for Bottom Shield (CSA 6.4)

According to the Canadian Standards Association (CSA), testing was performed to the CSA Standard C22.2 No. 0.3 test specification.

3.11 Aged Insulating Material used as Insulators Test (CSA 6.5)

A section of the cable system that only included the 3-conductor insulated cable sandwiched between two, blue polyvinyl strips was conditioned at 100°C for 7 days then placed between two steel plates which were energized to 1500 Volts AC for one minute. The voltage rate of rise was 500 volts AC per second.

3.12 Materials Compatibility and Degradation Test (CSA 6.6.5)

Three test specimen assemblies were submitted for testing. Each assembly included 3 m long, insulated 3-conductor cable, insulated tap, splice, and end assemblies. Test specimen 1 was tested as received with no environmental exposure. Test specimen 2 was subjected to 100°C for 7 days, then allowed to cool down to room temperature. Test specimen 3 was subjected to 32°C with 85% humidity for 14 days, then allowed to cool down to room temperature.
After environmental conditioning, all 3 test specimens were submerged in 100mm tap water at 25°C for 1 hour. The specimens were then subjected to 1500 Volts AC for 1 minute between adjacent conductors and between conductors and water. Voltage rate of rise was 500 volts AC per second.

3.13 Fault Penetration Test (CSA 6.6.6)

A 3-conductor 12 AWG test assembly and a 3-conductor 10 AWG test assembly each consisting of top shield and bottom shield and two folds were installed under carpet squares on a floor of plywood sheathing. Each conductor was connected to single phase line voltage (120/208 V) with a 20 amp fuse in-line for 12 AWG and a 30 amp fuse in-line for 10 AWG. All metal shields were grounded to provide a minimum of 120 volts from any phase conductor to the top shield.
At several locations on each conductor including the folds, the conductors were penetrated with two different objects(steel finishing nail and steel common nail) while energized. The penetration test was also performed on conductors not energized, but after penetration, the voltage was applied. The fuses blew in all the above conditions.

3.14 Ground Fault Test (CSA 6.6.7)

A complete test assembly with cable, 3 meters in length, was installed under carpet squares on a floor of plywood sheathing and consisting of a fold, a splice, and two transition boxes. 470 amps was applied to the 12 AWG test assembly for 4 seconds. The assembly was allowed to cool down to room temperature before applying the current a second time to the 12 AWG test assembly. The cable connections were then checked for electrical continuity.
This same test was performed on the 10 AWG test assembly except that 750 amps was applied for 4 seconds both times.

4. Validation

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5. Revision History
- Rev O - Original release
- Rev A - Re-branded to Commscope