



SUPER-TREX® SOO & SOOW PORTABLE CORD PASSES UL 2225 CRUSH & IMPACT TESTING

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INTRODUCTION

There are many applications requiring either a metal-clad armored cable, or a metal-clad armored cable suitable for hazardous locations. Metal-clad armored cables by nature are not flexible, and because of their stiffness can create installation problems. In tight spaces, or installations with several bends, a more flexible cable will simplify the installation, saving time and lowering cost. Although many applications will require a metal-clad armored cable, there are installations where a flexible cable is allowed, but the end-user is looking for the metal-clad armor protection.

This paper is written to define the crush and impact testing performed on TPC Wire & Cable's Super-Trex® Ultra-Gard™ Portable Cord, and Type TC Portable Cord. Both the Ultra-Gard and Type TC portable cords have exhibited excellent resistance to crush and impact in application; however this performance was never qualified per any test method. To better describe the crush and impact capabilities of these two cables, TPC put these cables through a Crush and Impact Test per UL 2225, test methods per UL 1569.

SUMMARY OF TESTS

The test standard used was UL 2225 – Cables and Cable-Fittings For Use In Hazardous (Classified) Locations. The test methods used were from UL 1569 – Metal-Clad Cables. The test requirements for passing the tests are the same requirements placed on Type MC-HL metal-clad cable for use in hazardous locations. For both the Ultra-Gard and the Type TC Portable Cord, a 14 AWG/3-Conductor sample was tested.

Crush Test

The crush test is performed on a cable with a length of at least 100 inches (2.55 meters). The cable is crushed at ten points along the length of the cable. The conductors are connected to a circuit indicator to ensure there is no contact between any of the conductors. Should any of the conductors within the cable come into contact with each other; the circuit indicator will send a signal identifying the contact.

The cable is crushed between flat, horizontal plates in a compression machine where the plates close at a rate of 0.50

± 0.05 inch/minute (10 ± 1 mm/min). Each plate is 2 inches wide (5.08 cm). A solid steel rod 3/4 inch (1.905 cm) in diameter, and the same length as the plate, is secured to the upper face of the lower plate. The cable is crushed and the force on the cable is increased until the circuit indicator signals that contact has occurred between two or more conductors. The force indicated on the compression machine is recorded at the moment the circuit indicator signals contact between two or more conductors. The cable is not acceptable if the average of the ten crushing trials is less than 1500 lbf. (pound-force), or 6672 N (Newton).

Impact Test

The impact test consists of a 25 lb. (11.34 kg) weight dropped from a height of 1 foot (30.48 cm) onto the cable. The weight has an upper face measuring 2 inches by 6 inches (5.08 cm by 15.24 cm), transitioning into a lower face that is a 0.75 inch (1.905 cm) rod. The conductors are connected to a circuit indicator to ensure there is no contact between any of the conductors. The cable is put through 10 impacts. The cable fails the test if more than two (2) impacts indicate contact between conductors.

CABLES UNDER TEST

Super-Trex® Ultra-Gard™ Portable Cord

Ultra-Gard is a Type SOO portable cord, 600 Volts, 90°C conductor temperature rating, UL, CSA and MSHA approvals with a FT-2 flame rating. It exhibits excellent resistance to abrasion, impact, and cutting. The use of rayon-reinforced synthetic fillers with a 100% fabric serve provides added protection against impact and crushing.

Super-Trex® Type TC Portable Cord

Our Type TC portable cord is a Type SOOW portable cord, 600 Volts, 90°C conductor temperature rating, UL, CSA and MSHA approvals with a FT-2 flame rating. Additionally it carries a TC-ER rating. It exhibits excellent resistance to abrasion, impact, and cutting. The use of rayon-reinforced synthetic fillers with a 100% fabric serve provides added protection against impact and crushing.

TEST DATA – CRUSH TEST

Cable Under Test: *Super-Trex® Ultra-Gard™*

| TEST SPECIMEN | POUND-FORCE (Lbf) | NEWTON (N) |
|--------------------|-------------------|----------------|
| 1 | 4525 | 20128.2 |
| 2 | 4824 | 21458.2 |
| 3 | 3919 | 17432.5 |
| 4 | 3138 | 13958.5 |
| 5 | 4132 | 18380.1 |
| 6 | 3867 | 17201.3 |
| 7 | 4165 | 18526.8 |
| 8 | 3909 | 17388.1 |
| 9 | 3989 | 17743.9 |
| 10 | 3803 | 16916.6 |
| AVERAGE | 4027 | 17912.9 |
| REQUIREMENT | 1500 | 6672 |

Cable Under Test: *Super-Trex® Type TC Portable Cord*

| TEST SPECIMEN | POUND-FORCE (Lbf) | NEWTON (N) |
|--------------------|-------------------|----------------|
| 1 | 3116 | 13860.6 |
| 2 | 5079 | 22592.5 |
| 3 | 4762 | 21182.4 |
| 4 | 4307 | 19158.5 |
| 5 | 4581 | 20377.3 |
| 6 | 5050 | 22463.5 |
| 7 | 3414 | 15186.2 |
| 8 | 5182 | 23050.7 |
| 9 | 5012 | 22294.5 |
| 10 | 4723 | 21008.9 |
| AVERAGE | 4523 | 20119.3 |
| REQUIREMENT | 1500 | 6672 |

TEST DATA – IMPACT TEST

Cable Under Test: *Super-Trex® Ultra-Gard™*

| IMPACT | CIRCUIT INDICATOR (Contact Between Conductors) |
|---|--|
| 1 | NO |
| 2 | NO |
| 3 | NO |
| 4 | NO |
| 5 | NO |
| 6 | NO |
| 7 | NO |
| 8 | NO |
| 9 | NO |
| 10 | NO |
| RESULT – 0 of 10 Impacts Created Contact Between Conductors – PASS | |

Cable Under Test: *Super-Trex® Type TC Portable Cord*

| IMPACT | CIRCUIT INDICATOR (Contact Between Conductors) |
|---|--|
| 1 | NO |
| 2 | NO |
| 3 | NO |
| 4 | NO |
| 5 | NO |
| 6 | NO |
| 7 | NO |
| 8 | NO |
| 9 | NO |
| 10 | NO |
| RESULT – 0 of 10 Impacts Created Contact Between Conductors – PASS | |

TEST RESULTS

Crush Test

Both the Ultra-Gard and the Type TC Portable Cord passed the Crushing Test. The average Pound-Force (Lbf) value required to pass this test is not less than 1500 Lbf (6670 N). The Ultra-Gard had an average of 4027 Lbf (17912.9 N) and the Type TC Portable Cord had an average value of 4523 Lbf (20119.3 N). These values are over 250% greater than required to pass the crushing test for a metal-clad armored cable!

Impact Test

Both the Ultra-Gard and the Type TC Portable Power cords passed the Impact Test. The test allows up to two (2) drops where contact between conductors was indicated. Both the Ultra-Gard and the Type TC Portable Cord recorded zero instances of contact between conductors during the impact test.

SUMMARY

Both the Ultra-Gard and the Type TC Portable Cord passed the Crush and Impact testing per UL 2225, the same crush

and impact requirements placed on Type MC-HL (Metal-Clad, Hazardous Location) cables. The Ultra-Gard and Type TC Portable Cord exhibit the same crush and impact resistance in a Type SOO/SOOW cord as a metal-clad armored cable!

This offers advantages in flexibility, bend-radius, termination time, installation costs and a safer product to handle due to no sharp edges. Also, since both the Ultra-Gard and Type TC Portable Cords are SOO/SOOW rated cords, they are designated as “Extra-Hard Usage” cords, suitable for use in Hazardous Locations.

Many installations will require the use of a Type MC or Type MC-HL cable. However where a flexible cable is allowed, and crush and impact resistance is needed, the Super-Trex Ultra-Gard or Type TC Portable Cord will meet the requirements.

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