

**Report No.** TC.19.07.004942

**Date of Issue** 07/26/2019

**Applicant:** Caledonian Cables Limited

**Applicant address:** 1/F., CMA Building, 64-66 Connaught Road Central, Hong Kong

**Description of the test subject:**

| Sample | Description   | Photo  |
|--------|---|--|
| 001    | <p>Sample Description: Fire Resistant Electric Cables</p> <p>Style No:<br/>RE-2X(C)HSWAH...CI</p> <p>Ratings: 50C×2.5mm<sup>2</sup></p> <p>Brand name: CALEDONIAN</p> |  |

**Receipt Date of Sample:** 07/17/2019

**Date of Testing:** From 07/17/2019 to 07/26/2019

**Sample submitted:** The sample(s) was (were) submitted by applicant and identified.

**Conclusion:**

| Test Items |   |                     | Conclusion      |
|------------|---|---------------------|-----------------|
| No.        | Items   | Standard            |                 |
| 1          | Vertically-mounted bunched wires or cables burn testing             | IEC 60332-3-24:2018 | Pass            |
| 2          | Smoke density testing   | IEC 61034-2:2013    | Pass            |
| 3          | Determination of the halogen acid gas content                       | IEC 60754-1:2011    | See test result |
| 4          | Determination of acidity (by PH measurement) and conductivity       | IEC 60754-2:2011    | Pass            |
| 5          | Tests for electric cables under fire conditions - Circuit integrity | IEC 60331-1:2018    | Pass            |

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**Test Results**

**1. IEC 60332-3-24:2018 Tests on electric and optical fibre cables under fire conditions - Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category C (Edition 2.0)**

**1.1 Sample details**

|  |      |
|--|------|
| Specimen size(m)                                     | 3.5  |
| Cable diameter (mm)                                  | 45.8 |
| Conductor diameter (mm)                              | 2.0  |
| Non-metallic volume per meter of test sample(L)      | 1.5  |
| Range of conductor cross-sections (mm <sup>2</sup> ) | ≤35  |
| Number of layers                                     | 1    |
| Number of burners                                    | 1    |
| Flame application time (min)                         | 20   |

|              |                  |              |             |
|--------------|------------------|--------------|-------------|
| Precondition | Temperature (°C) | Humidity (%) | Duration(h) |
|              | 20±10            | 50±20        | 16          |

**1.2 Test results**

|                           |        |
|---------------------------|--------|
| Measurements/ observation | Result |
| The extent of damage      | 0.5m   |

**Requirement:** The maximum extent of the charred portion measured on the sample shall not have reached a height exceeding 2.5m above the bottom edge of the burner.

**Conclusion:** Pass

**2. IEC 61034-2:2013 Measurement of smoke density of cables burning under defined conditions Part 2: Test procedure and requirements**

**2.1 Sample details**

|          |        |
|----------|--------|
| Diameter | 45.8mm |
|----------|--------|

|                  |              |                 |          |
|------------------|--------------|-----------------|----------|
| Pre-conditioning | Indoor       |                 | Duration |
|                  | Temp: 23±2°C | Humidity: 50±5% | 16 h     |

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|                 |               |
|-----------------|---------------|
| Ignition Source | Fire source 1 |
|-----------------|---------------|

**2.2 Test Result**

|  |      |
|--|------|
| The minimum light transmittance within 40 minutes; (%) | 95.4 |
|--|------|

**Requirement:** Within the first 40 minutes, the light transmittance shall not drop to below 60%.

**Conclusion:** Pass

**3. IEC 60754-1:2011 Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content**

**3.1 Sample details**

|        |  |
|--------|--|
| Weight | Sheath: S1: 1.0169 g; S2: 1.0075 g<br>Insulation: S1: 1.0096 g; S2: 1.0103 g |
|--------|--|

| Precondition | Temperature (°C) | Humidity (%) | Duration(h) |
|--------------|------------------|--------------|-------------|
|              | 23±2             | 50±5         | 16          |

**3.2 Test Result**

| Sheath | Gas (mg/g) | 1  | 2  | Average |
|--------|------------|----|----|---------|
|        | HCl        | ND | ND | ND      |

| Insulation | Gas (mg/g) | 1  | 2  | Average |
|------------|------------|----|----|---------|
|            | HCl        | ND | ND | ND      |

**Remark:** 1) Halogen acids evolved, except hydrofluoric acid, was expressed as hydrochloric acid(HCl).  
2)ND-Not Detected

**4. IEC 60754-2:2011 Test on gases evolved during combustion of materials from cables – part 2: Determination of acidity (by PH measurement) and conductivity**

**4.1 Sample details**

|        |  |
|--------|--|
| Weight | Sheath: S1: 1.0075 g; S2: 1.0109 g<br>Insulation: S1: 1.0071 g; S2: 1.0102 g |
|--------|--|

| Precondition | Temperature (°C) | Humidity (%) | Duration(h) |
|--------------|------------------|--------------|-------------|
|--------------|------------------|--------------|-------------|

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|  |      |      |    |
|--|------|------|----|
|  | 23±2 | 50±5 | 16 |
|--|------|------|----|

**4.2 Test Result**

| Test Item(Sheath)   | Result |      | Average |
|---------------------|--------|------|---------|
| PH                  | 4.82   | 4.80 | 4.81    |
| Conductivity(μs/mm) | 0.73   | 0.72 | 0.73    |

| Test Item(Insulation) | Result |      | Average |
|-----------------------|--------|------|---------|
| PH                    | 4.30   | 4.33 | 4.32    |
| Conductivity(μs/mm)   | 2.56   | 2.56 | 2.56    |

**Requirement:** PH ≥ 4.3, Conductivity ≤10 μs/mm

**Conclusion:** Pass

**5. IEC 60331-1:2018 Tests for electric cables under fire conditions - Circuit integrity - Part 1: Test method for fire with shock at a temperature of at least 830°C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter exceeding 20 mm (Edition 2.0)**

**5.1 Sample details:**

|                      |   |
|----------------------|---|
| Diameter             | 45.8mm  |
| Sample size          | 1200 mm   |
| Min. bending radius  | 6D  |
| Test duration        | 120min  |
| Voltage              | 500V  |
| Shock application    | The shock-producing device impacts the wall after 5min±10s from activation and subsequently at 5min±10s intervals |
| Atmosphere condition | 10°C-40°C   |

|            |  |
|------------|--|
| Cable type | Electric power and control cables with rated voltage up to and including 600/1000V |
|------------|--|

**5.2 Test results:**

|   |    |
|---|----|
| Record  | 1  |
| Fuse failure or interruption of the circuit breaker(Yes/No) | No |

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|                                |    |
|--------------------------------|----|
| The lamp extinguishing(Yes/No) | No |
|--------------------------------|----|

**Point of failure**

The criteria for determining the point of failure shall be as follows:

- 1) The voltage is not maintained during the test duration, as indicated by fuse failure or by interruption of the circuit breaker.
- 2) A conductor ruptures during the test duration, as indicated by the lamp extinguishing.

**Evaluation: Pass**

**Statement:** The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to the sole criterion for assessing the potential smoke and toxicity hazard of the product in use.

Changzhou Jinbiao Railway Transportation Technical Service Co., Ltd.

Drafted by:

Lynn liu

Approved by:

Shen hui

-End of Report-

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