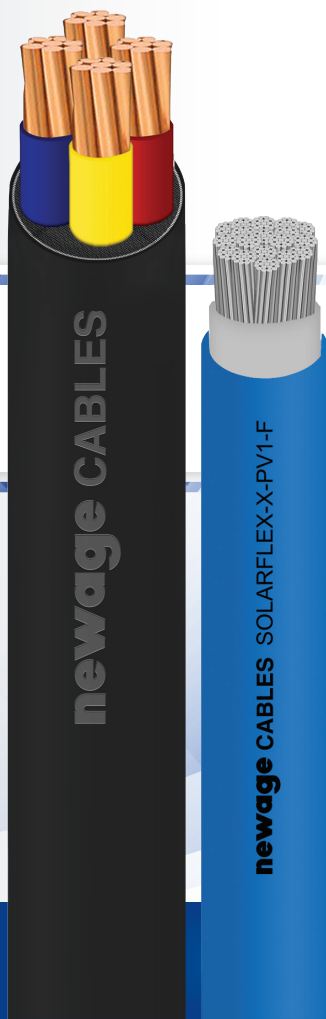


# newage

## GENERAL WIRING, FLEXIBLE & SOLAR CABLES



PROVEN  
RELIABILITY  
SINCE 1956







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# PREMIUM WIRING CABLE







## INTRODUCTION

Newage Cables Pvt. Ltd. is a technologically advanced cable manufacturing company. It was established in 1956 with the vision of self-reliance and a commitment to contribute to the country's development by supplying versatile products of the highest quality standard and safety, coupled with prompt services.

Through its policy of continuous expansion and improvement, Newage Cables has emerged as one of the largest cable manufacturers and first in its category to be accredited with ISO 9001 in Pakistan. We have also developed other allied manufacturing facilities like Chemical & Plastics. Newage Cables is an ultra-modern, fully-integrated cable industry, equipped with the high-tech machinery, highly skilled manpower and well-equipped laboratories.

Our range of cable products meets the requirements of a broad spectrum of applications including construction, electric utilities, distribution, industrial, oil & gas and petrochemical sectors.

All products are manufactured to the latest BS & IEC standards; the prevalent cable standard in Pakistan. However, Newage is also capable and experienced in manufacturing products complying with other international standards like DIN, ASTM and VDE etc. From the development of fire-resistant cables in 2001 to launching state-of-the-art 66 KV CDCC CCV Maillefer line in 2022, with the highest voltage range of cable testing in Pakistan of up to 120KV, Newage Cables proves itself as leader in cable industry and a responsible visionary manufacturer. Today Newage Cables has successfully exported its products to more than 10 countries and is looking further to capture new markets. Our global clientele is a testimony to our products being well accepted. We remain committed to providing our clients with a rewarding experience with our world class products.

Newage Cables has continuously been expanding its capacity, capability and product range by improving and expanding existing manufacturing facilities and also setting up new modernized manufacturing facilities to keep itself in line with requirements.

## SPECIFICATION & CONSTRUCTION

### CONDUCTORS

A conductor is the metallic part of cables that is carrying the electric current.

Material of Conductor could be:

- Plain annealed or tin coated copper conductor (ASTM B49)

The conductor structure is complying with the requirements of BS EN 60228 (IEC 60228). Conductor can be Solid, Stranded, Non-Compacted, Circular Compacted or Flexible conductors depending upon requirement.

### INSULATION

Each core conductor is insulated by extruded Polyvinyl chloride (PVC) confirming to BS 7655. Insulation thickness and material for electric power, lighting and internal wiring is based on BS 6004 & BS EN 50525-2-31 suitable for 300/500V and 450/750V. Insulation thickness and material for Flexible wires and cables is based on BS 6500 & BS EN 50525-2-11 suitable for 300/500V.

**TABLE 1: INSULATED CORE COLOR CODES**

| NO. OF CORES | CONVENTIONAL COLORS CODE                    | COLORS TO BS 7671                         |
|--------------|---|---|
| Single Core  | Red/Yellow/Blue/Black/Green or Green/Yellow | Grey /Blue/ Brown/ Black or Green/Yellow  |
| Two Core     | Red & Black                                 | Brown & Blue                              |
| Three Core   | Red, Yellow and Blue                        | Brown, Black & Grey                       |
| Four Core    | Red, Yellow, Blue & Black                   | Blue, Brown, Black & Grey                 |
| Five Core    | Red, Yellow, Blue, Black & Green/ Yellow    | Green / Yellow, Blue, Brown, Black & Grey |

### INNER COVERING

Inner Covering for multicore cables is extruded PVC to BS 6004 to make the cable circular and prevent insulation from adhering to sheath.

### OUTER SHEATH (OUTERJACKET)

It is the outer protection part of the cable against the surrounding environment. Outer sheath for multicore cables is extruded polyvinyl chloride (PVC) confirming to BS 7655.





## NOMINAL VOLTAGE

The Nominal voltage is to be expressed with two values of alternative current  $U_0/U$  in V (volt)

|         |   |                                     |
|---------|---|-------------------------------------|
| $U_0/U$ | : | Phase To Earth Voltage              |
| $U_0$   | : | Voltage between Conductor & Earth   |
| $U$     | : | Voltage between Phases (Conductors) |

## RESISTANCE

The D.C resistance of the cables depends upon its X-sectional area of the conductor. These values slightly vary with the change in temperature. The required values are normally given at 20°C. However the values can be converted to sapicific temprature by using the formula:

|          |   |  |   |
|----------|---|--|---|
| $R_t$    | = | $R_{20} \times [1 + \alpha (t - 20)]$        | $\Omega/\text{km}$                              |
| $R_t$    | : | Conductor DC Resistance at $t^\circ\text{C}$ | $\Omega/\text{km}$                              |
| $R_{20}$ | : | Conductor DC Resistance at 20°C              | $\Omega/\text{km}$                              |
| $t$      | : | Operating Temperature                        | $^\circ\text{C}$                                |
| $\alpha$ | : | Resistance Temperature Coefficient           | = 0.00393 for Copper<br>= 0.00403 for Aluminium |

Generally DC resistance is based on IEC 60228.

## CABLE SHORT CIRCUIT CAPACITY

|             |   |                                     |               |
|-------------|---|-------------------------------------|---------------|
| $I_{sc}(t)$ | = | $115 \times S / \sqrt{t}$           | A             |
| $S$         | : | Cross section Area of the Conductor | $\text{mm}^2$ |
| $t$         | : | Duration of Short circuit for       | second        |

## VOLTAGE DROP

When the current flows in conductor, there is a voltage drop between the ends of the conductor. For low voltage cable network of normal operation, it is advisable of a voltage drop of 3 % for Lighting and 5% for other uses maximum as per BS 7671.

Voltage drop can be calculated by using the following formula:

|             |   |  |
|-------------|---|--|
| $V_d$       | = |  |
| $I$         | = | Current in Amperes                     |
| $L$         | = | Route Length in Meters                 |
| $\text{mV}$ | = | Approximate Volt Drop / Ampere / Meter |



## CONDUCTOR DATA

### Class 2 Stranded Conductors for single-core and Multi-core cables.

| Nominal Area of Conductor | Minimum Number of Wires in the Conductor |                    | Maximum Resistance of Conductor at 20°C |                    |
|---------------------------|--|--------------------|---|--------------------|
|                           | Circular                                 | Circular Compacted | Annealed Copper Conductor               |                    |
|                           | Cu                                       | Cu                 | Plain Wires                             | Metal Coated Wires |
| mm <sup>2</sup>           |  |                    | Ω/km                                    | Ω/km               |
| * 1.0                     | 1  | -                  | 18.10                                   | 18.20              |
| ** 1.5                    | 7  | 6                  | 12.10                                   | 12.2               |
| ** 2.5                    | 7  | 6                  | 7.41                                    | 7.56               |
| 4                         | 7  | 6                  | 4.61                                    | 4.70               |
| 6                         | 7  | 6                  | 3.08                                    | 3.11               |
| 10                        | 7  | 6                  | 1.83                                    | 1.84               |
| 16                        | 7  | 6                  | 1.15                                    | 1.16               |
| 25                        | 7  | 6                  | 0.727                                   | 0.734              |
| 35                        | 7  | 6                  | 0.524                                   | 0.529              |
| 50                        | 19                                       | 6                  | 0.387                                   | 0.391              |
| 70                        | 19                                       | 12                 | 0.268                                   | 0.270              |
| 95                        | 19                                       | 15                 | 0.193                                   | 0.195              |
| 120                       | 37                                       | 18                 | 0.153                                   | 0.154              |
| 150                       | 37                                       | 18                 | 0.124                                   | 0.126              |
| 185                       | 37                                       | 30                 | 0.0991                                  | 0.100              |
| 240                       | 37                                       | 34                 | 0.0754                                  | 0.0706             |
| 300                       | 61                                       | 34                 | 0.0601                                  | 0.0607             |

\* Solid Conductor

\*\* Can be Supplied with Solid Conductor, If Required

### Class 5 Flexible Copper Conductors for Single-Core and Multi-Core Cables. 0.6/1 KV Confirming to IEC 60228

| Nominal Cross Sectional Area | Maximum Diameter of Wires in Conductor | Maximum Resistance of Conductor at 20° C |                    |
|------------------------------|--|--|--------------------|
|                              |  | Plain Wires                              | Metal Coated Wires |
| mm <sup>2</sup>              | mm                                     | Ω/km                                     | Ω/km               |
| 0.75                         | 0.21                                   | 26.00                                    | 26.70              |
| 1.0                          | 0.21                                   | 19.50                                    | 20.00              |
| 1.5                          | 0.26                                   | 13.30                                    | 13.70              |
| 2.5                          | 0.26                                   | 7.98                                     | 8.21               |
| 4.0                          | 0.31                                   | 4.95                                     | 5.09               |



## DIMENSIONS & WEIGHTS

## GENERAL WIRING

### SINGLE CORE CABLES - 450/750V - BS 6004, BS EN 50525-2-31 CU. /PVC - PVC Insulated, Copper Conductor

| Nominal Area<br>of Conductor | Radial Thickness<br>of Insulation | Mean Overall Diameter |             | Approx.<br>Cable Weight |
|------------------------------|-----------------------------------|-----------------------|-------------|-------------------------|
|                              |                                   | Lower Limit           | Upper Limit |                         |
| mm <sup>2</sup>              | mm                                | mm                    | mm          | kg / km                 |
| 1.5                          | 0.7                               | 2.7                   | 3.3         | 23                      |
| 2.5                          | 0.8                               | 3.3                   | 4.0         | 35                      |
| 4                            | 0.8                               | 3.8                   | 4.6         | 51                      |
| 6                            | 0.8                               | 4.3                   | 5.2         | 72                      |
| 10                           | 1.0                               | 5.6                   | 6.7         | 120                     |
| 16                           | 1.0                               | 6.4                   | 7.8         | 182                     |
| 25                           | 1.2                               | 8.1                   | 9.7         | 276                     |
| 35                           | 1.2                               | 9.0                   | 10.9        | 370                     |
| 50                           | 1.4                               | 10.6                  | 12.8        | 504                     |
| 70                           | 1.4                               | 12.1                  | 14.6        | 708                     |
| 95                           | 1.6                               | 14.1                  | 17.1        | 970                     |
| 120                          | 1.6                               | 15.6                  | 18.8        | 1220                    |
| 150                          | 1.8                               | 17.3                  | 20.9        | 1500                    |
| 185                          | 2.0                               | 19.3                  | 23.3        | 1860                    |
| 240                          | 2.2                               | 22.0                  | 26.6        | 2450                    |
| 300                          | 2.4                               | 24.5                  | 29.6        | 3050                    |

### SINGLE CORE CABLES - 300/500V - BS 6004 CU. /PVC/PVC - PVC Insulated, PVC Sheathed, Copper Conductor

| Nominal Area<br>of Conductor | Radial Thickness<br>of Insulation | Radial Thickness<br>of Sheath | Mean Overall Diameter |             | Approx.<br>Cable Weight |
|------------------------------|-----------------------------------|-------------------------------|-----------------------|-------------|-------------------------|
|                              |                                   |                               | Lower Limit           | Upper Limit |                         |
| mm <sup>2</sup>              | mm                                | mm                            | mm                    | mm          | kg / km                 |
| 1                            | 0.6                               | 0.8                           | 3.7                   | 4.5         | 28                      |
| 1.5                          | 0.7                               | 0.8                           | 4.5                   | 5.0         | 36                      |
| 2.5                          | 0.8                               | 0.8                           | 5.3                   | 5.7         | 50                      |
| 4                            | 0.8                               | 0.9                           | 5.5                   | 6.7         | 75                      |
| 6                            | 0.8                               | 0.9                           | 6.0                   | 7.3         | 100                     |
| 10                           | 1.0                               | 0.9                           | 7.3                   | 8.8         | 150                     |
| 16                           | 1.0                               | 1.0                           | 8.4                   | 10.1        | 220                     |

## DIMENSIONS & WEIGHTS

## GENERAL WIRING

### TWO CORE CABLES - 300/500V - BS 6004

**Cu. /PVC/PVC - PVC Insulated, PVC Sheathed, Copper Conductor**

| Nominal Area of Conductor | Radial Thickness of Insulation | Radial Thickness of Inner Covering | Radial Thickness of Sheath | Mean Overall Diameter |             | Approx. Cable Weight |
|---------------------------|--------------------------------|------------------------------------|----------------------------|-----------------------|-------------|----------------------|
|                           |                                |                                    |                            | Lower Limit           | Upper Limit |                      |
| mm <sup>2</sup>           | mm                             | mm                                 | mm                         | mm                    | mm          | kg / km              |
| 1                         | 0.6                            | 0.4                                | 1.0                        | 6.4                   | 8.0         | 90                   |
| 1.5                       | 0.7                            | 0.4                                | 1.2                        | 8.4                   | 10.5        | 130                  |
| 2.5                       | 0.8                            | 0.4                                | 1.2                        | 9.6                   | 12.0        | 175                  |
| 4                         | 0.8                            | 0.4                                | 1.2                        | 10.5                  | 13.0        | 225                  |
| 6                         | 0.8                            | 0.4                                | 1.2                        | 11.5                  | 14.0        | 295                  |
| 10                        | 1.0                            | 0.6                                | 1.4                        | 15.0                  | 17.5        | 470                  |

### TWO CORE CABLES (FLAT) - 300/500V - BS 6004

**Cu. /PVC/PVC - PVC Insulated, PVC Sheathed, Copper Conductor**

| Nominal Area of Conductor | Radial Thickness of Insulation | Radial Thickness of Sheath | Mean Overall Diameter |             | Approx. Cable Weight |
|---------------------------|--------------------------------|----------------------------|-----------------------|-------------|----------------------|
|                           |                                |                            | Lower Limit           | Upper Limit |                      |
| mm <sup>2</sup>           | mm                             | mm                         | mm                    | mm          | kg / km              |
| 1                         | 0.6                            | 0.90                       | 4.0 x 6.2             | 4.7 x 7.4   | 55                   |
| 1.5                       | 0.7                            | 0.9                        | 4.9 x 8.0             | 5.4 x 8.4   | 75                   |
| 2.5                       | 0.8                            | 1.0                        | 5.6 x 9.2             | 6.2 x 9.8   | 110                  |
| 4                         | 0.8                            | 1.0                        | 5.6 x 9.6             | 7.2 x 11.5  | 155                  |
| 6                         | 0.8                            | 1.1                        | 6.4 x 10.5            | 8.0 x 13.0  | 200                  |
| 10                        | 1.0                            | 1.2                        | 7.8 x 13.0            | 9.6 x 16.0  | 320                  |





## DIMENSIONS & WEIGHTS

## GENERAL WIRING

### THREE CORE CABLES - 300/500V - BS 6004

**Cu. /PVC/PVC - PVC Insulated, PVC Sheathed, Copper Conductor**

| Nominal Area of Conductor | Radial Thickness of Insulation | Radial Thickness of Inner Covering | Radial Thickness of Sheath | Mean Overall Diameter |             | Approx. Cable Weight |
|---------------------------|--------------------------------|------------------------------------|----------------------------|-----------------------|-------------|----------------------|
|                           |                                |                                    |                            | Lower Limit           | Upper Limit |                      |
| mm <sup>2</sup>           | mm                             | mm                                 | mm                         | mm                    | mm          | kg / km              |
| 1                         | 0.6                            | 0.4                                | 1.2                        | 6.5                   | 8.4         | 115                  |
| 1.5                       | 0.7                            | 0.4                                | 1.2                        | 8.8                   | 11.0        | 155                  |
| 2.5                       | 0.8                            | 0.4                                | 1.2                        | 10.0                  | 12.50       | 210                  |
| 4                         | 0.8                            | 0.4                                | 1.2                        | 11.0                  | 13.5        | 280                  |
| 6                         | 0.8                            | 0.4                                | 1.4                        | 12.5                  | 15.5        | 375                  |
| 10                        | 1.0                            | 0.6                                | 1.4                        | 15.5                  | 19.0        | 595                  |

### FOUR CORE CABLES - 300/500V - BS 6004

**Cu. /PVC/PVC - PVC Insulated, PVC Sheathed, Copper Conductor**

| Nominal Area of Conductor | Radial Thickness of Insulation | Radial Thickness of Inner Covering | Radial Thickness of Sheath | Mean Overall Diameter |             | Approx. Cable Weight |
|---------------------------|--------------------------------|------------------------------------|----------------------------|-----------------------|-------------|----------------------|
|                           |                                |                                    |                            | Lower Limit           | Upper Limit |                      |
| mm <sup>2</sup>           | mm                             | mm                                 | mm                         | mm                    | mm          | kg / km              |
| 1                         | 0.6                            | 0.4                                | 1.2                        | 7.7                   | 9.4         | 130                  |
| 1.5                       | 0.7                            | 0.4                                | 1.2                        | 9.6                   | 12.0        | 180                  |
| 2.5                       | 0.8                            | 0.4                                | 1.2                        | 11.0                  | 13.5        | 250                  |
| 4                         | 0.8                            | 0.4                                | 1.4                        | 12.5                  | 15.0        | 350                  |
| 6                         | 0.8                            | 0.6                                | 1.4                        | 14.0                  | 17.0        | 475                  |
| 10                        | 1.0                            | 0.6                                | 1.4                        | 17.0                  | 20.5        | 730                  |

## DIMENSIONS & WEIGHTS

## FLEXIBLE CABLES

### SINGLE CORE CABLES - 450/750V - BS 6004, BS EN 50525-2-31

#### FLEX. Cu. /PVC - PVC Insulated, Flexible Copper Conductor

| Nominal Area<br>of Conductor | Radial Thickness<br>of Insulation | Mean Overall Diameter |             | Approx.<br>Cable Weight |
|------------------------------|-----------------------------------|-----------------------|-------------|-------------------------|
|                              |                                   | Lower Limit           | Upper Limit |                         |
| mm <sup>2</sup>              | mm                                | mm                    | mm          | kg / km                 |
| 1.5                          | 0.7                               | 2.8                   | 3.4         | 22                      |
| 2.5                          | 0.8                               | 3.4                   | 4.1         | 35                      |
| 4                            | 0.8                               | 3.9                   | 4.8         | 50                      |
| 6                            | 0.8                               | 4.4                   | 5.3         | 70                      |
| 10                           | 1.0                               | 5.7                   | 6.8         | 120                     |
| 16                           | 1.0                               | 6.7                   | 8.1         | 180                     |
| 25                           | 1.2                               | 8.4                   | 10.2        | 280                     |
| 35                           | 1.2                               | 9.7                   | 11.7        | 380                     |
| 50                           | 1.4                               | 11.5                  | 13.9        | 540                     |
| 70                           | 1.4                               | 13.2                  | 16.0        | 750                     |
| 95                           | 1.6                               | 15.1                  | 18.2        | 990                     |
| 120                          | 1.6                               | 16.7                  | 20.2        | 1250                    |
| 150                          | 1.8                               | 18.6                  | 22.5        | 1570                    |
| 185                          | 2.0                               | 20.6                  | 24.9        | 1920                    |
| 240                          | 2.2                               | 23.5                  | 28.4        | 2520                    |

### TWO CORE CABLES - 300/500V - BS 6500, BS EN 50525-2-11

#### FLEX. Cu./PVC/PVC - PVC Insulated, PVC Sheathed, Flexible Copper Conductor

| Nominal Area<br>of Conductor | Radial Thickness<br>of Insulation | Radial Thickness<br>of Sheath | Mean Overall Diameter |             | Approx.<br>Cable Weight |
|------------------------------|-----------------------------------|-------------------------------|-----------------------|-------------|-------------------------|
|                              |                                   |                               | Lower Limit           | Upper Limit |                         |
| mm <sup>2</sup>              | mm                                | mm                            | mm                    | mm          | kg / km                 |
| 0.75                         | 0.6                               | 0.8                           | 5.7                   | 7.2         | 70                      |
| 1                            | 0.6                               | 0.8                           | 5.9                   | 7.5         | 75                      |
| 1.5                          | 0.7                               | 0.8                           | 6.8                   | 8.6         | 100                     |
| 2.5                          | 0.8                               | 1.0                           | 8.4                   | 10.6        | 150                     |
| 4                            | 0.8                               | 1.1                           | 9.7                   | 12.1        | 200                     |



## DIMENSIONS & WEIGHTS

## FLEXIBLE CABLES

### THREE CORE CABLES - 300/500V - BS 6500, BS EN 50525-2-11

#### FLEX. Cu./PVC/PVC - PVC Insulated, PVC Sheathed, Flexible Copper Conductor

| Nominal Area<br>of Conductor | Radial Thickness<br>of Insulation | Radial Thickness<br>of Sheath | Mean Overall Diameter |             | Approx.<br>Cable Weight |
|------------------------------|-----------------------------------|-------------------------------|-----------------------|-------------|-------------------------|
|                              |                                   |                               | Lower Limit           | Upper Limit |                         |
| mm <sup>2</sup>              | mm                                | mm                            | mm                    | mm          | kg / km                 |
| 0.75                         | 0.6                               | 0.8                           | 6.0                   | 7.6         | 75                      |
| 1                            | 0.6                               | 0.8                           | 6.3                   | 8.0         | 90                      |
| 1.5                          | 0.7                               | 0.9                           | 7.4                   | 9.4         | 120                     |
| 2.5                          | 0.8                               | 1.1                           | 9.2                   | 11.4        | 180                     |
| 4                            | 0.8                               | 1.2                           | 10.5                  | 13.1        | 250                     |

### FOUR CORE CABLES - 300/500V - BS 6500, BS EN 50525-2-11

#### FLEX. Cu./PVC/PVC - PVC Insulated, PVC Sheathed, Flexible Copper Conductor

| Nominal Area<br>of Conductor | Radial Thickness<br>of Insulation | Radial Thickness<br>of Sheath | Mean Overall Diameter |             | Approx.<br>Cable Weight |
|------------------------------|-----------------------------------|-------------------------------|-----------------------|-------------|-------------------------|
|                              |                                   |                               | Lower Limit           | Upper Limit |                         |
| mm <sup>2</sup>              | mm                                | mm                            | mm                    | mm          | kg / km                 |
| 0.75                         | 0.6                               | 0.8                           | 6.6                   | 8.3         | 90                      |
| 1                            | 0.6                               | 0.9                           | 7.1                   | 9.0         | 110                     |
| 1.5                          | 0.7                               | 1.0                           | 8.4                   | 10.5        | 150                     |
| 2.5                          | 0.8                               | 1.1                           | 10.1                  | 12.5        | 220                     |
| 4                            | 0.8                               | 1.2                           | 11.5                  | 14.3        | 310                     |



## CURRENT RATING & VOLTAGE DROP

### CURRENT RATING ASSUMPTIONS

- The calculation of the current ratings, Current rating equations (100% load factor) and calculation of losses are based on IEC 60287 series , and the values of Current ratings are derived from BS 7671, IEE Wiring Regulations, Seventeenth edition.
- The calculation is based on the standard dimensions of cables, which may have a slight difference from the applied cable dimension which are following the best common Manufacturing practices.

The basis of the standard conditions which is:

|                                   |   |                  |
|-----------------------------------|---|------------------|
| <b>Ambient Air Temperature</b>    | : | <b>30 °C</b>     |
| <b>Ambient Ground Temperature</b> | : | <b>20 °C</b>     |
| <b>Depth of laying in ground</b>  | : | <b>0.70 m</b>    |
| <b>Soil Thermal Resistivity</b>   | : | <b>2.5 K.m/W</b> |

For other Installation conditions or any value of different air/ ground temperature, depth of laying, different soil thermal resistivity the customer is advised to multiply the tabulated current By the de-rating factor values.

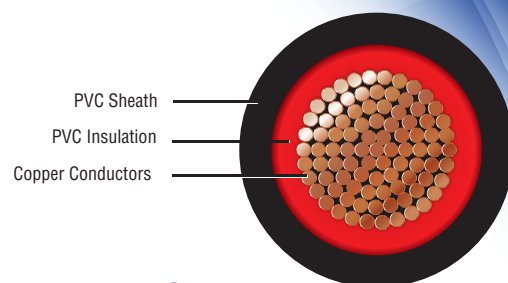
To obtain the current carrying capacity and voltage drop for the cables with the flexible conductor (Class 5), the tabulated values should be multiplied by the following factors:

| CABLE SIZE           | CURRENT-CARRYING CAPACITY | VOLTAGE DROP |
|----------------------|---------------------------|--------------|
| $\leq 16\text{mm}^2$ | 0.95                      | 1.10         |
| $\geq 25\text{mm}^2$ | 0.97                      | 1.06         |



# SINGLE CORE CABLE UNARMoured (COPPER CONDUCTOR)

|               |   |                                      |
|---------------|---|--------------------------------------|
| Type          | : | CU/PVC or CU/PVC/PVC                 |
| Standard      | : | BS 6004, BS EN 50525-2-31, IEC 60228 |
| Rated Voltage | : | 450/750 V                            |
| Conductor     | : | Plain Annealed Stranded Copper Wires |
| Insulation    | : | 70° C PVC                            |
| Outer Sheath  | : | PVC                                  |



## CURRENT CARRYING CAPACITY (AMPERES)

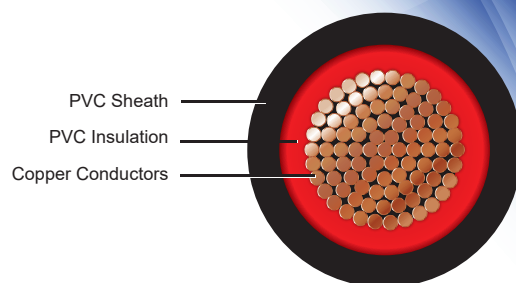
Ambient Temperature: 30° C | Conductor Operating Temperature: 70° C

| Cross<br>Sectional<br>Area of<br>Conductor | Reference Method A<br>(Enclosed in Conduit<br>in Thermally<br>Insulating Wall etc.) |      | Reference Method B<br>(Enclosed in Conduit on<br>a wall or in trunking etc.) |      | Reference Method C<br>(Clipped Direct)                    |     | Reference Method F<br>(In Free Air or on a Perforated Cable<br>Tray Horizontal or Vertical) |     |     |   |     |
|--|---|------|--|------|---|-----|---|-----|-----|---|-----|
|  | 2 Cables<br>Single Phase<br>A.C or D.C  |      | 3 or 4<br>Cables<br>Three Phase<br>A.C                                       |      | 2 Cables<br>Single Phase<br>A.C or D.C<br>Flat & Touching |     | Touching  |     |     | Spaced by One Diameter  |     |
|  |   |      |  |      |   |     | 2 Cables<br>Single Phase<br>A.C or D.C<br>Flat  |     |     | 2 Cables<br>Single Phase A.C or D.C<br>3 Cables<br>Three Phase A.C Flat |     |
|  |   |      |  |      |   |     |   |     |     |   |     |
| 1  | 2   | 3    | 4  | 5    | 6   | 7   | 8   | 9   | 10  | 11  | 12  |
| mm²  | A   | A    | A  | A    | A   | A   | A   | A   | A   | A   | A   |
| 1  | 11.0  | 10.5 | 13.5   | 12   | 15.5  | 14  | -   | -   | -   | -   | -   |
| 1.5  | 14.5  | 13.5 | 17.5   | 15.5 | 20  | 18  | -   | -   | -   | -   | -   |
| 2.5  | 20  | 18   | 24   | 21   | 27  | 25  | -   | -   | -   | -   | -   |
| 4  | 26  | 24   | 32   | 28   | 37  | 33  | -   | -   | -   | -   | -   |
| 6  | 34  | 31   | 41   | 36   | 47  | 43  | -   | -   | -   | -   | -   |
| 10   | 46  | 42   | 57   | 50   | 65  | 59  | -   | -   | -   | -   | -   |
| 16   | 61  | 56   | 76   | 68   | 87  | 79  | -   | -   | -   | -   | -   |
| 25   | 80  | 73   | 101  | 89   | 114   | 104 | 131   | 114 | 110 | 146   | 130 |
| 35   | 99  | 89   | 125  | 110  | 141   | 129 | 162   | 143 | 137 | 181   | 162 |
| 50   | 119   | 108  | 151  | 134  | 182   | 167 | 196   | 174 | 167 | 219   | 197 |
| 70   | 151   | 136  | 192  | 171  | 234   | 214 | 251   | 225 | 216 | 281   | 254 |
| 95   | 182   | 164  | 232  | 207  | 284   | 261 | 304   | 275 | 264 | 341   | 311 |
| 120  | 210   | 188  | 269  | 239  | 330   | 303 | 352   | 321 | 308 | 396   | 362 |
| 150  | 240   | 216  | 300  | 262  | 381   | 349 | 406   | 372 | 356 | 456   | 419 |
| 185  | 273   | 245  | 341  | 296  | 436   | 400 | 463   | 427 | 409 | 521   | 480 |
| 240  | 321   | 286  | 400  | 346  | 515   | 472 | 546   | 507 | 485 | 615   | 569 |
| 300  | 367   | 328  | 458  | 394  | 594   | 545 | 629   | 587 | 561 | 709   | 659 |



# SINGLE CORE CABLE UNARMoured (COPPER CONDUCTOR)

|               |   |                                      |
|---------------|---|--------------------------------------|
| Type          | : | CU/PVC or CU/PVC/PVC                 |
| Standard      | : | BS 6004, BS EN 50525-2-31, IEC 60228 |
| Rated Voltage | : | 450/750 V                            |
| Conductor     | : | Plain Annealed Stranded Copper Wires |
| Insulation    | : | 70° C PVC                            |
| Outer Sheath  | : | PVC                                  |



## VOLTAGE DROP (PER AMPERE PER METER)

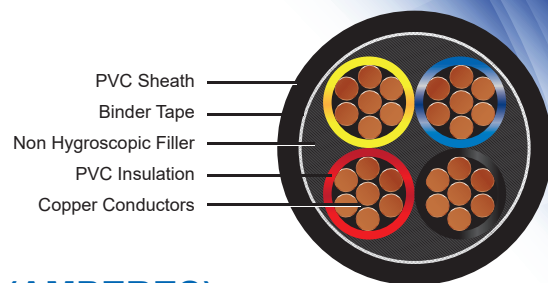
Conductor Operating Temperature: 70° C

| Cross<br>Sectional<br>Area of<br>Conductor | 2 Cables<br>D.C | 2 Cables Single Phase A.C  |  |      |            |                  |  |            |  |  | 3 or 4 Cables Three Phase A.C |      |                            |            |       |                           |            |      |      |            |      |      |
|--|-----------------|--|--|------|------------|------------------|--|------------|--|--|-------------------------------|------|----------------------------|------------|-------|---------------------------|------------|------|------|------------|------|------|
|  |                 | Reference<br>Method A & B<br>(Enclosed in<br>Conduit<br>or Trunking) | Reference Method C & F<br>(Clipped Direct, on Tray or in Free Air) |      |            |                  |  |            | Reference<br>Method A & B<br>(Enclosed in<br>Conduit<br>or Trunking) | Reference Method C & F<br>(Clipped Direct, on Tray or in Free Air) |                               |      |                            |            |       |                           |            |      |      |            |      |      |
|  |                 |  | Cable<br>Touching  |      |            | Cable<br>Spaced* |  |            |  | Cable<br>Touching,<br>Trefoil                                      |                               |      | Cable<br>Touching,<br>Flat |            |       | Cable<br>Spaced*,<br>Flat |            |      |      |            |      |      |
| 1  | 2               | 3  |  |      | 4          |                  |  | 5          |  |  | 6                             |      |                            | 7          |       |                           | 8          |      |      | 9          |      |      |
| mm <sup>2</sup>                            | mV / A / m      | mV / A / m   |  |      | mV / A / m |                  |  | mV / A / m |  |  | mV / A / m                    |      |                            | mV / A / m |       |                           | mV / A / m |      |      | mV / A / m |      |      |
| 1  | 44              | 44   |  |      | 44         |                  |  | 44         |  |  | 38                            |      |                            | 38         |       |                           | 38         |      |      | 38         |      |      |
| 1.5  | 29              | 29   |  |      | 29         |                  |  | 29         |  |  | 25                            |      |                            | 25         |       |                           | 25         |      |      | 25         |      |      |
| 2.5  | 18              | 18   |  |      | 18         |                  |  | 18         |  |  | 15                            |      |                            | 15         |       |                           | 15         |      |      | 15         |      |      |
| 4  | 11              | 11   |  |      | 11         |                  |  | 11         |  |  | 9.5                           |      |                            | 9.5        |       |                           | 9.5        |      |      | 9.5        |      |      |
| 6  | 7.3             | 7.3  |  |      | 7.3        |                  |  | 7.3        |  |  | 6.4                           |      |                            | 6.4        |       |                           | 6.4        |      |      | 6.4        |      |      |
| 10   | 4.4             | 4.4  |  |      | 4.4        |                  |  | 4.4        |  |  | 3.8                           |      |                            | 3.8        |       |                           | 3.8        |      |      | 3.8        |      |      |
| 16   | 2.8             | 2.8  |  |      | 2.8        |                  |  | 2.8        |  |  | 2.4                           |      |                            | 2.4        |       |                           | 2.4        |      |      | 2.4        |      |      |
|  |                 | r  | x  | z    | r          | x                |  | r          | x  | z  |                               | x    | z                          | r          | x     | z                         | r          | x    | z    | r          | x    | z    |
| 25   | 1.75            | 1.80   | 0.33   | 1.80 | 1.75       | 0.200            |  | 1.75       | 0.29   | 1.80   |                               | 0.29 | 1.55                       | 1.50       | 0.175 | 1.50                      | 1.50       | 0.25 | 1.55 | 1.50       | 0.32 | 1.55 |
| 35   | 1.25            | 1.30   | 0.31   | 1.30 | 1.25       | 0.195            |  | 1.25       | 0.28   | 1.30   |                               | 0.27 | 1.10                       | 1.100      | 0.170 | 1.10                      | 1.10       | 0.24 | 1.10 | 1.10       | 0.32 | 1.15 |
| 50   | 0.93            | 0.95   | 0.30   | 1.00 | 0.93       | 0.190            |  | 0.93       | 0.28   | 0.97   |                               | 0.26 | 0.85                       | 0.800      | 0.165 | 0.82                      | 0.80       | 0.24 | 0.84 | 0.80       | 0.32 | 0.86 |
| 70   | 0.63            | 0.65   | 0.29   | 0.72 | 0.63       | 0.185            |  | 0.63       | 0.27   | 0.69   |                               | 0.25 | 0.61                       | 0.550      | 0.160 | 0.57                      | 0.55       | 0.24 | 0.60 | 0.55       | 0.31 | 0.63 |
| 95   | 0.46            | 0.49   | 0.28   | 0.56 | 0.47       | 0.180            |  | 0.47       | 0.27   | 0.54   |                               | 0.24 | 0.48                       | 0.410      | 0.155 | 0.43                      | 0.41       | 0.23 | 0.47 | 0.40       | 0.31 | 0.51 |
| 120  | 0.36            | 0.39   | 0.27   | 0.47 | 0.37       | 0.1075           |  | 0.37       | 0.26   | 0.45   |                               | 0.23 | 0.41                       | 0.320      | 0.150 | 0.36                      | 0.32       | 0.23 | 0.40 | 0.32       | 0.30 | 0.44 |
| 150  | 0.29            | 0.31   | 0.27   | 0.41 | 0.30       | 0.175            |  | 0.29       | 0.26   | 0.39   |                               | 0.23 | 0.36                       | 0.260      | 0.150 | 0.30                      | 0.26       | 0.23 | 0.34 | 0.26       | 0.30 | 0.40 |
| 185  | 0.23            | 0.25   | 0.27   | 0.37 | 0.24       | 0.0170           |  | 0.24       | 0.26   | 0.35   |                               | 0.23 | 0.32                       | 0.210      | 0.145 | 0.26                      | 0.21       | 0.22 | 0.31 | 0.21       | 0.30 | 0.36 |
| 240  | 0.180           | 0.195  | 0.26   | 0.33 | 0.185      | 0.165            |  | 0.185      | 0.25   | 0.31   |                               | 0.23 | 0.29                       | 0.160      | 0.145 | 0.22                      | 0.160      | 0.22 | 0.27 | 0.160      | 0.29 | 0.34 |
| 300  | 0.145           | 0.160  | 0.26   | 0.31 | 0.150      | 0.165            |  | 0.150      | 0.25   | 0.29   |                               | 0.23 | 0.27                       | 0.130      | 0.140 | 0.190                     | 0.130      | 0.22 | 0.25 | 0.130      | 0.29 | 0.32 |



# MULTI-CORE CABLE UNARMoured (COPPER CONDUCTOR)

|               |  |
|---------------|--|
| Type          | : CU/PVC/PVC                           |
| Standard      | : BS 6004, BS EN 50525-2-31, IEC 60228 |
| Rated Voltage | : 300/500 V                            |
| Conductor     | : Plain Annealed Stranded Copper Wires |
| Insulation    | : 70° C PVC                            |
| Outer Sheath  | : PVC                                  |



## CURRENT CARRYING CAPACITY (AMPERES)

Ambient Temperature: 30° C | Conductor Operating Temperature: 70° C

| Cross<br>Sectional<br>Area of<br>Conductor | Reference Method A<br>(Enclosed in Conduit<br>in Thermally<br>Insulating Wall etc.) |   | Reference Method B<br>(Enclosed in Conduit on<br>a wall or in trunking etc.) |   | Reference Method C<br>(Clipped Direct)             |   | Reference Method E<br>(In Free Air or on a Perforated<br>Cable Tray etc. Horizontal & Vertical) |   |
|--|---|---|--|---|--|---|---|---|
|  | 1 Two-Core<br>Cable*<br>Single Phase<br>A.C or D.C                                  | 1 Three or<br>Four Core<br>Cable*<br>Three Phase<br>A.C | 1 Two-Core<br>Cable*<br>Single Phase<br>A.C or D.C                           | 1 Three or<br>Four Core<br>Cable*<br>Three Phase<br>A.C | 1 Two-Core<br>Cable*<br>Single Phase<br>A.C or D.C | 1 Three or<br>Four Core<br>Cable*<br>Three Phase<br>A.C | 1 Two-Core<br>Cable*<br>Single Phase<br>A.C or D.C  | 1 Three or<br>Four Core<br>Cable*<br>Three Phase<br>A.C |
| 1  | 2   | 3   | 4  | 5   | 6  | 7   | 8   | 9   |
| mm <sup>2</sup>                            | A   | A   | A  | A   | A  | A   | A   | A   |
| 1  | 11  | 10  | 13   | 11.5  | 15   | 13.5  | 17  | 14.5  |
| 1.5  | 14  | 13  | 16.5   | 15  | 19.5   | 17.5  | 22  | 18.5  |
| 2.5  | 18.5  | 17.5  | 23   | 20  | 27   | 24  | 30  | 25  |
| 4  | 25  | 23  | 30   | 27  | 36   | 32  | 40  | 34  |
| 6  | 32  | 29  | 38   | 34  | 46   | 41  | 51  | 43  |
| 10   | 43  | 39  | 52   | 46  | 63   | 57  | 70  | 60  |

## VOLTAGE DROP (PER AMPERE PER METER)

Conductor Operating Temperature: 70° C

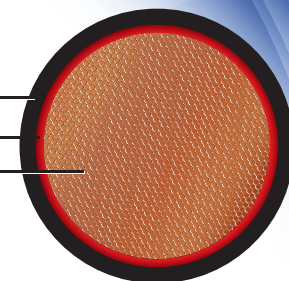
| Cross<br>Sectional<br>Area of<br>Conductor | Two-Core<br>Cable D.C | Two-Core Cable Single Phase A.C | Three or Four Core Cables, Three Phase A.C |
|--|-----------------------|---------------------------------|--|
| 1  | 2                     | 3                               | 4  |
| mm <sup>2</sup>                            | mV / A/m              | mV / A/m                        | mV / A/m                                   |
| 1  | 44                    | 44                              | 38   |
| 1.5  | 29                    | 29                              | 25   |
| 2.5  | 18                    | 18                              | 15   |
| 4  | 11                    | 11                              | 9.5  |
| 6  | 7.30                  | 7.3                             | 6.4  |
| 10   | 4.40                  | 4.4                             | 3.8  |



## FLEXIBLE CABLE UNARMoured (COPPER CONDUCTOR)

|               |  |
|---------------|--|
| Type          | : CU/PVC/PVC                           |
| Standard      | : BS 6500, BS EN 50525-2-11, IEC 60228 |
| Rated Voltage | : 300/500 V                            |
| Conductor     | : Class 5 Flexible Copper Wires        |
| Insulation    | : 60° C PVC                            |
| Outer Sheath  | : PVC                                  |

PVC Sheath  
PVC Insulation  
Copper Conductors



### CURRENT CARRYING CAPACITY (AMPERES)

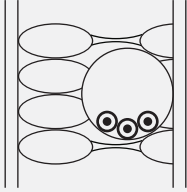
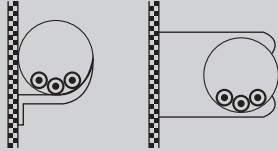
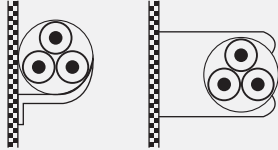
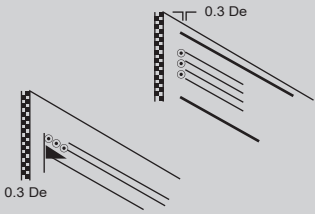
| Cross Sectional<br>Area of Conductor | CURRENT CARRYING CAPACITY |                  |
|--------------------------------------|---------------------------|------------------|
|                                      | Single Phase A.C.         | Three Phase A.C. |
| 1                                    | 2                         | 3                |
| mm <sup>2</sup>                      | A                         | A                |
| <b>0.75</b>                          | 6                         | 6                |
| <b>1.00</b>                          | 10                        | 10               |
| <b>1.50</b>                          | 16                        | 16               |
| <b>2.50</b>                          | 25                        | 20               |
| <b>4.00</b>                          | 32                        | 25               |

### VOLTAGE DROP (PER AMPERE PER METER)

Conductor Operating Temperature: 60° C

| Cross Sectional<br>Area of Conductor | CURRENT CARRYING CAPACITY |                  |
|--------------------------------------|---------------------------|------------------|
|                                      | D.C. or Single Phase A.C. | Three Phase A.C. |
| 1                                    | 2                         | 3                |
| mm <sup>2</sup>                      | mV/A/m                    | mV/A/m           |
| <b>0.75</b>                          | 62                        | 54               |
| <b>1.00</b>                          | 46                        | 40               |
| <b>1.50</b>                          | 32                        | 27               |
| <b>2.50</b>                          | 19                        | 16               |
| <b>4.00</b>                          | 12                        | 10               |

# INSTALLATION METHODS FOR WIRES / CABLES

| Examples  | Description  | Reference Method to be Used to Determine Current Carrying Capacity |
|---|--|--|
|    | Non-sheathed cables in conduit in a thermally insulated wall with an inner skin having a thermal conductance of not less than 10 W/m²K | A  |
|    | Non-sheathed cables in a conduit on a wooden or masonry wall or spaced less than 0.3 x conduit diameter from it.                       | B  |
|  | Single -core or multicore cables: Fixed on (clipped direct), or spaced less than x cables diameter from wooden or masonry wall.        | C  |
|  | Single -core or multicore cables: On perforated tray run horizontally or vertically.   | E & F  |

C: Care is needed where the cable runs vertically and ventilation is restricted. The ambient temperature at the top of the vertical section can be much higher.

H: De = the external diameter of a multicore cable”  
2.2 x the cable diameter when three single core cables are bound in trefoil, or  
3 x the diameter when three single core cables are laid in flat formation.

# CORRECTION FACTORS

**Table 4B1: Rating Factors for Ambient Air Temperature Other than 30°C.**

| Air Temperature | 25°C          | 30°C | 35°C | 40°C | 45°C | 50°C | 55°C |
|-----------------|---------------|------|------|------|------|------|------|
| Cable Type      | Rating Factor |      |      |      |      |      |      |
| PVC Insulated   | 1.03          | 1.00 | 0.94 | 0.87 | 0.79 | 0.71 | 0.61 |

**Rating Factors for Ambient Air Temperature Other than 30°C (Flexible Cables)**

| Ground Temperature | 30°C          | 35°C | 40°C | 45°C | 50°C | 55°C |
|--------------------|---------------|------|------|------|------|------|
| Cable Type         | Rating Factor |      |      |      |      |      |
| PVC Insulated      | 1.00          | 0.91 | 0.82 | 0.71 | 0.58 | 0.41 |

**Table 4C1: Rating Factors for One Circuit or One Multi-Core Cable or For A Group of Circuits or Group of Multi-Core Cables.**

| Items | Arrangement Cable Touching  | Number of Circuits or Multicore Cables |      |      |      |      |      |      |      |      |      |      |      | To be used with Current-Carrying Capacities Reference Method |
|-------|---|--|------|------|------|------|------|------|------|------|------|------|------|--|
|       |   | 1                                      | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 12   | 16   | 20   |  |
| 1     | Bunched in Air on a Surface Embedded or Enclosed                              | 1.00                                   | 0.80 | 0.70 | 0.65 | 0.60 | 0.57 | 0.54 | 0.52 | 0.50 | 0.45 | 0.41 | 0.38 | A to F   |
| 2     | Single Layer on Wall or Floor   | 1.00                                   | 0.85 | 0.79 | 0.75 | 0.73 | 0.72 | 0.72 | 0.71 | 0.70 | 0.70 | 0.70 | 0.70 | C  |
| 3     | Single Layer Multicore on Perforated Horizontal or Vertical Cable Tray System | 1.00                                   | 0.88 | 0.82 | 0.77 | 0.75 | 0.73 | 0.73 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | E  |
| 4     | Single Layer Multicore on Ladder System or Cleats etc.                        | 1.00                                   | 0.87 | 0.82 | 0.80 | 0.80 | 0.79 | 0.79 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 |  |

Note 1: These factors are applicable to uniform groups of cables, equally loaded.

Note 2: Where horizontal clearances between adjacent cables exceed twice their overall diameter, no rating factor need be applied.  
The same factors are applied to:

Note 3: - groups of two or three single-core cables.  
-multicore cables.

If a group consists of both two- and three-core cables, the total number of cables are taken as the number of circuits, and the corresponding factor is applied to the tables for two loaded conductor for the two-core cables and to the Tables for three loaded conductors for the three-core cables

Note 4: If a group consists of n single-core cables it may either be considered as n/2 circuits of two loaded conductors or n/3 circuits of three loaded conductors

Note 5: The rating factors given have been averaged over the range of conductor sizes and types of installation included in Tables 4DIA 10 4J4A (BS 7671) and the overall accuracy of tabulated values in within 5%

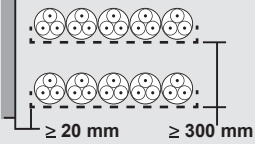
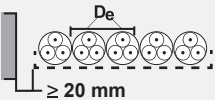
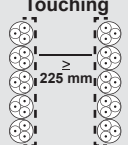
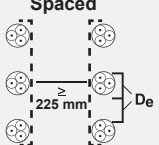
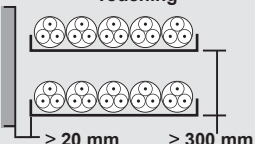
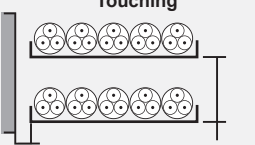
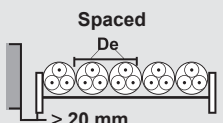
Note 6: For some installations and for other methods not provided for in the above table, it may be appropriate to use factors calculated for specific cases, see for example Tables 4C4 and 4C5 (BS 7671).

Note 7: Where cables having differing conductor operating temperature are grouped together. the current rating is to be based upon the lowest operating temperature of any cable in the group.

Note 8: If due to known operating conditions, a cable is expected to carry not more than 30 % of its grouped rating it may be ignored for the purpose of obtaining the rating factor for the rest of the group. For example, a group of N Loaded cables would normally require a group rating factor of C<sub>g</sub> applied to the tabulated It. However, if M cables in the group carry loads which are not greater than 0.3 C<sub>g</sub>lt amperes the other cables can be sized by using the group rating factor corresponding to (N-M) cables.

# CORRECTION FACTORS

**Table 4C4: Rating Factors for Groups of More than One Multicore Cable for Cable in Free Air.**

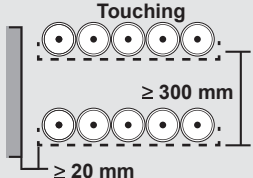
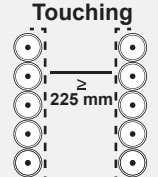
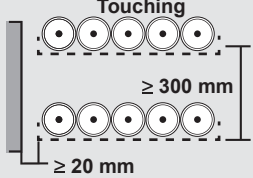
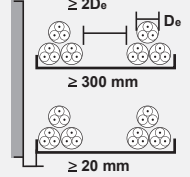
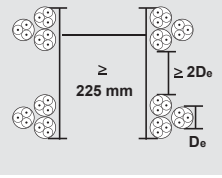
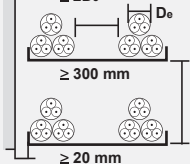
| Installation Method in Table 4A2                        |                |  | Number of Trays or Ladders | Number of Three-Phase Circuits Per Tray or Ladder |      |      |      |      |      |
|---|----------------|--|----------------------------|---|------|------|------|------|------|
|   |                |  |                            | 1   | 2    | 3    | 4    | 6    | 9    |
| Perforated Cable Tray Systems (Note 3)                  | 31             | <b>Touching</b><br>   | 1                          | See Item 3 of Table 4C1                           |      |      |      |      |      |
|   |                |  | 2                          | 1.00  | 0.87 | 0.80 | 0.77 | 0.73 | 0.68 |
|   |                |  | 3                          | 1.00  | 0.86 | 0.79 | 0.76 | 0.71 | 0.66 |
|   |                |  | 6                          | 1.00  | 0.84 | 0.77 | 0.73 | 0.68 | 0.64 |
|   |                | <b>Spaced</b><br>     | 1                          | 1.00  | 1.00 | 0.98 | 0.95 | 0.91 | -    |
|   |                |  | 2                          | 1.00  | 0.99 | 0.96 | 0.92 | 0.87 | -    |
|   |                |  | 3                          | 1.00  | 0.98 | 0.95 | 0.91 | 0.85 | -    |
| Vertical Perforated Cable Tray Systems (Note 4)         | 31             | <b>Touching</b><br>  | 1                          | See Item 3 of Table 4C1                           |      |      |      |      |      |
|   |                |  | 2                          | 1.00  | 0.88 | 0.81 | 0.76 | 0.71 | 0.70 |
|   |                | <b>Spaced</b><br>   | 1                          | 1.00  | 0.91 | 0.89 | 0.88 | 0.87 | -    |
|   |                |  | 2                          | 1.00  | 0.91 | 0.88 | 0.87 | 0.85 | -    |
| Unperforated Cable Tray Systems                         | 30             | <b>Touching</b><br> | 1                          | 0.97  | 0.84 | 0.78 | 0.75 | 0.71 | 0.68 |
|   |                |  | 2                          | 0.97  | 0.83 | 0.76 | 0.72 | 0.68 | 0.63 |
|   |                |  | 3                          | 0.97  | 0.82 | 0.75 | 0.71 | 0.66 | 0.61 |
|   |                |  | 6                          | 0.97  | 0.81 | 0.73 | 0.69 | 0.63 | 0.58 |
| Cable Ladder Systems cleats wire mesh tray etc (Note 3) | 32<br>33<br>34 | <b>Touching</b><br> | 1                          | See Item 3 of Table 4C1                           |      |      |      |      |      |
|   |                |  | 2                          | 1.00  | 0.86 | 0.8  | 0.78 | 0.76 | 0.73 |
|   |                |  | 3                          | 1.00  | 0.85 | 0.79 | 0.76 | 0.73 | 0.70 |
|   |                |  | 6                          | 1.00  | 0.84 | 0.77 | 0.73 | 0.68 | 0.64 |
|   |                | <b>Spaced</b><br>   | 1                          | 1.00  | 1.00 | 1.00 | 1.00 | 1.00 | -    |
|   |                |  | 2                          | 1.00  | 0.99 | 0.98 | 0.97 | 0.96 | -    |
|   |                |  | 3                          | 1.00  | 0.98 | 0.97 | 0.96 | 0.93 | -    |

- Note 1: Values given are average for the cable types and range of conductor sizes considered in Tables 4D2A to 4J4A (BS 7671) The spread of values generally less than 5%.
- Note 2: Factors apply to single layer groups of cables as shown above and do not apply when cables are installed in more than one layer touching each other, Values for such installation may be significantly lower and must be determined by an appropriate method.
- Note 3: Values are given for vertical spacing between cable trays of 300 mm and at least 20 mm between cable trays and wall For closer spacing the factors should be reduced.
- Note 4: Values are given for horizontal spacing between cable trays of 225 mm with cable trays mounted back to back For closer spacing the factors should be reduced.



# CORRECTION FACTORS

**Table 4C5: Rating Factors for Groups of One or More Circuits of Single Core Cables for Cable in Free Air.**

| Installation Method in Table 4A2                        |    |   | Number of Trays or Ladders | Number of Three-Phase Circuits Per Tray or Ladder |      |      | Use as a Multiplier to Rating for    |
|---|----|---|----------------------------|---|------|------|--------------------------------------|
|   |    |   |                            | 1   | 2    | 3    |                                      |
| Perforated Cable Tray Systems (Note 3)                  | 31 |    | 1                          | 0.98  | 0.91 | 0.87 | These cables in horizontal formation |
|   |    |   | 2                          | 0.96  | 0.87 | 0.81 |                                      |
|   |    |   | 3                          | 0.95  | 0.85 | 0.78 |                                      |
| Vertical Perforated cable tray Systems (Note 4)         | 31 |    | 1                          | 0.96  | 0.86 | -    | These cables in vertical formation   |
|   |    |   | 2                          | 0.95  | 0.84 | -    |                                      |
| Cable Ladder Systems cleats wire mesh tray etc (Note 3) | 32 |   | 1                          | 1.00  | 0.97 | 0.96 | These cables in horizontal formation |
|   | 33 |   | 2                          | 0.98  | 0.93 | 0.89 |                                      |
|   | 34 |   | 3                          | 0.97  | 0.90 | 0.86 |                                      |
| Perforated Cable Tray Systems (Note 3)                  | 31 |  | 1                          | 1.00  | 0.98 | 0.96 | These cables in trefoil formation    |
|   |    |   | 2                          | 0.97  | 0.93 | 0.89 |                                      |
|   |    |   | 3                          | 0.96  | 0.92 | 0.86 |                                      |
| Vertical Perforated cable tray Systems (Note 4)         | 31 |  | 1                          | 1.00  | 0.91 | 0.89 |                                      |
|   |    |   | 2                          | 1.00  | 0.90 | 0.86 |                                      |
| Cable Ladder Systems cleats wire mesh tray etc (Note 3) | 32 |  | 1                          | 1.00  | 1.00 | 1.00 |                                      |
|   | 33 |   | 2                          | 0.97  | 0.95 | 0.93 |                                      |
|   | 34 |   | 3                          | 0.96  | 0.94 | 0.90 |                                      |

- Note 1: Values given are average for the cable types and range of conductor sizes considered in Tables 4D1A to 4D3A (BS 7671). The spread of values is generally less than 5%.
- Note 2: Factors apply to single layer groups of cables for trefoil groups as shown above and do not apply when cables are installed in more than one layer touching each other, Values for such installation may be significantly lower and must be determined by an appropriate method.
- Note 3: Values are given for vertical spacing between cable trays of 300 mm and at least 20 mm between cable trays and wall For closer spacing the factors should be reduced.
- Note 4: Values are given for horizontal spacing between cable trays of 225 mm with cable trays mounted back to back For closer spacing the factors should be reduced.
- Note 5: For circuits having more than one cable in parallel per phase, each three-phase set of conductors is to be considered as a circuit for the purpose of this table.





NEWAGE SOLAR CABLES - SOLARFLEX-X-PV1-F

**NEWAGE  
SOLAR CABLES**  
SOLARFLEX-X-PV1-F

**newage**  
**CABLES**



## SPECIFICATION

Single core power cable, for photovoltaic and solar system use, insulated and sheathed with cross linked polyolefin compound. Flame retardant, halogen free, low smoke, UV & Ozone resistant flexible cable for fixed laying.

### THERMAL CHARACTERISTICS

- Operating Temperature
 

|         |        |
|---------|--------|
| Normal  | 90 °C  |
| Maximum | 120 °C |

 (For 20,000 h)
- Expected Life Time\*
 

|            |
|------------|
| > 25 years |
|------------|
- Max. Short Circuit Temp.
 

|                  |
|------------------|
| 250 °C for 5 Sec |
|------------------|

### STANDARDS

BS EN 50618 : 2015, TUV 2 PFG 1169 / 08.2007, IEC 60228  
 BS 6360, BSEN 62230, BS EN 50363-5, BS EN 60811-401  
 BS EN 60811-403, BS EN 60811-404, BS EN 60811-501  
 BS EN 60811-503, BS EN 60811-504, BS EN 60811-505  
 BS EN 60811-506, BS EN 60811-507, BS EN 60811-508  
 BS EN 60216-1-1, BS EN 50395, BS EN 50396, IEC 61034  
 IEC 60332-1-2, BS EN 50525-1, BS EN 60754-1  
 BS EN 61034-2, BS EN 60754-2

### ELECTRICAL CHARACTERISTICS

- Rated Voltage
 

|         |          |
|---------|----------|
| Normal  | 1500V DC |
| Maximum | 1800V DC |

### CONSTRUCTION

- Conductor
 

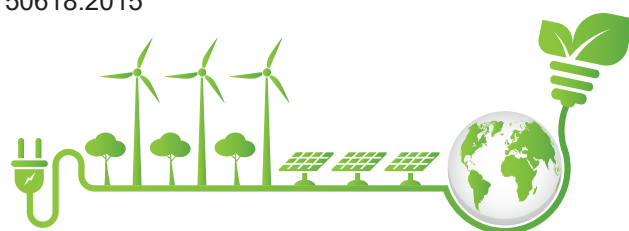
|   |
|---|
| Tinned Coated Flexible Copper, Class 5 according to IEC 60228 |
|---|
- Insulation
 

|                                  |
|----------------------------------|
| Cross Linked Polyolefin Compound |
|----------------------------------|
- Sheath
 

|                                  |
|----------------------------------|
| Cross Linked Polyolefin Compound |
|----------------------------------|

| Cross Sectional Area of Conductor | Insulation Thickness Nominal | Sheath Thickness Nominal | Overall Diameter Approx | DC Resistance of Conductor at 20°C | Insulation Resistance at 20°C | Insulation Resistance at 90°C |
|-----------------------------------|------------------------------|--------------------------|-------------------------|------------------------------------|-------------------------------|-------------------------------|
| mm²                               | mm                           | mm                       | mm                      | Ω / KM                             | M Ω. KM                       | MΩ. KM                        |
| 1.5                               | 0.7                          | 0.8                      | 5.4                     | 13.70                              | 860                           | 0.86                          |
| 2.5                               | 0.7                          | 0.8                      | 5.9                     | 8.21                               | 690                           | 0.69                          |
| 4                                 | 0.7                          | 0.8                      | 6.6                     | 5.09                               | 580                           | 0.58                          |
| 6                                 | 0.7                          | 0.8                      | 7.4                     | 3.39                               | 500                           | 0.50                          |
| 10                                | 0.7                          | 0.8                      | 8.8                     | 1.95                               | 420                           | 0.42                          |
| 16                                | 0.7                          | 0.9                      | 10.1                    | 1.24                               | 340                           | 0.34                          |
| 25                                | 0.9                          | 1.0                      | 12.5                    | 0.795                              | 340                           | 0.34                          |
| 35                                | 0.9                          | 1.1                      | 14.0                    | 0.565                              | 290                           | 0.29                          |
| 50                                | 1.0                          | 1.2                      | 16.3                    | 0.393                              | 270                           | 0.27                          |
| 70                                | 1.1                          | 1.2                      | 18.7                    | 0.277                              | 250                           | 0.25                          |
| 95                                | 1.1                          | 1.3                      | 20.8                    | 0.21                               | 220                           | 0.22                          |
| 120                               | 1.2                          | 1.3                      | 22.8                    | 0.164                              | 210                           | 0.21                          |
| 150                               | 1.4                          | 1.4                      | 25.5                    | 0.132                              | 210                           | 0.21                          |
| 185                               | 1.6                          | 1.6                      | 28.5                    | 0.108                              | 200                           | 0.20                          |
| 240                               | 1.7                          | 1.7                      | 32.1                    | 0.0817                             | 200                           | 0.20                          |

- DC Resistance is in accordance with IEC 60228
- Dimensions & Insulation Resistance is in accordance with BS EN 50618:2015
- Expected lifetime is for normal usage conditions



## CURRENT CARRYING CAPACITY

### CURRENT CARRYING CAPACITY ACCORDING TO METHOD OF INSTALLATION

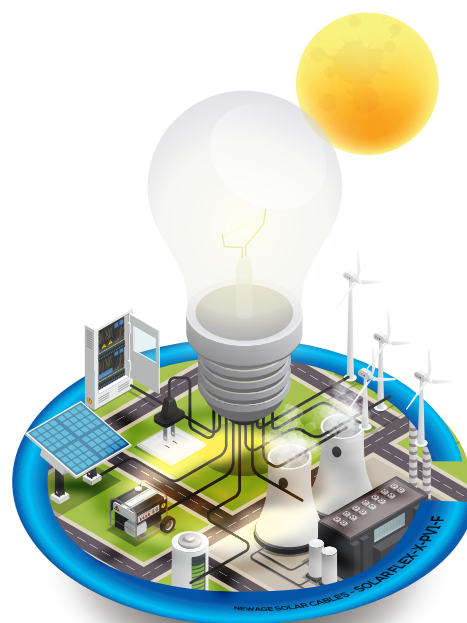
| Cross Sectional Area of Conductor | Single Cable Free in Air | Single Cable on a Surface | Two Loaded Cables Touching on a Surface |
|-----------------------------------|--------------------------|---------------------------|---|
| mm <sup>2</sup>                   | A                        | A                         | A                                       |
| 1.5                               | 30                       | 29                        | 24                                      |
| 2.5                               | 41                       | 39                        | 33                                      |
| 4                                 | 55                       | 52                        | 44                                      |
| 6                                 | 70                       | 67                        | 57                                      |
| 10                                | 98                       | 93                        | 79                                      |
| 16                                | 132                      | 125                       | 107                                     |
| 25                                | 176                      | 167                       | 142                                     |
| 35                                | 218                      | 207                       | 176                                     |
| 50                                | 276                      | 262                       | 221                                     |
| 70                                | 347                      | 330                       | 278                                     |
| 95                                | 416                      | 395                       | 333                                     |
| 120                               | 488                      | 464                       | 390                                     |
| 150                               | 566                      | 538                       | 453                                     |
| 185                               | 644                      | 612                       | 515                                     |
| 240                               | 775                      | 736                       | 620                                     |

Ambient temperature: 60 °C. For other temperature see below table

### DE-RATING FACTOR

| Air Temperature  | Up to 60 °C | 70 °C | 80 °C | 90 °C |
|------------------|-------------|-------|-------|-------|
| De-Rating Factor | 1.00        | 0.92  | 0.84  | 0.75  |

**TRANSMITTING  
SUN'S ENERGY  
THROUGH NEWAGE  
SOLAR CABLES  
SOLARFLEX-X-PV1-F**



## CABLE INSTALLATION RECOMMENDATION

At temperatures of about 0° C plastic cables begin to stiffen and should not be bent sharply or struck at these, or lower temperatures. Prior to installation, cables should be stored for at least 24 hours in a warm place. Low temperatures have no harmful effect; cables regain their normal flexibility at higher temperatures.

Cables should be installed in accordance with the appropriate installation authority regulations.

Bending radius (minimum internal radius of bend) six times the diameter.

We recommend the following special guidelines, in conjunction with the standard installation instructions.

- The cables should be stored in proper packed condition, in shade and direct exposure to sun should be avoided.
- Use pay in rollers and corner rollers of non-metallic material (Nylon or Teflon) at least every 3 to 4 meters while laying the cable.
- As far as possible installation should be undercover or indoors. For outdoor installation, direct exposure to sunlight should be avoided by using a suitable cable tray.
- The cables should not be in contact with any hot surface.
- The requirement of minimum bending radius should be followed as per data sheet.
- Any clamping device should not be applied directly on the outer sheath. There should be some cushion (for instance a rubber pad of approx. 3 mm thickness) between the cable's outer surface and clamps.

Maximum distance of unsupported length of cable for horizontal and vertical run should be as below:

| Overall Diameter of Cable (mm) | Maximum Spacing Between the Supports for Horizontal Run (m) | Maximum Spacing Between the Supports for Vertical Run (m) |
|--------------------------------|---|---|
| 0 - 14.9                       | 350   | 450   |
| 15 - 19.9                      | 400   | 550   |
| 20 - 39.9                      | 450   | 600   |
| 40 - 59.9                      | 700   | 900   |
| 60 & above                     | 1100  | 1300  |

## MINIMUM INSTALLATION RADIUS

Cable should not be bent during installation to a radius smaller than that recommended. The Recommended Radius (minimum internal radius of bend) for the cables mentioned in this catalogue should exceed four times the diameter of the cable. Wherever possible larger installation radius should be used.

## TEST AFTER INSTALLATION

A voltage test after installation should be performed with direct current of 3.5 KV DC between conductor phases and the same value between each conductor and Armouring.

During the test, the voltage should be increased gradually to the full value and maintained continuously for 15 min. The test should be made between conductors and between each conductor and armour.

The requirement is: **“NO BREAKDOWN SHOULD OCCUR”**

The test voltages given above are intended for cables immediately after installation and not for cables that have been in service. When testing is required after cables have been in service, regardless of service duration, Newage Cables Company- Technical Department should be consulted for the appropriate test conditions, which depend on the individual circumstances.

## CABLES FAULTS PREVENTION

The Low Voltage Cables faults are possible due to different reasons:

1. Physical damage due to mishandling or misuse.
2. Physical damage during operations.
3. Over current.
4. Fire or excessive temperature at the cables location.
5. Manufacturing malfunction, which Newage Cables Company guarantees its product against any defect or wrong workmanship, meanwhile in case of damage due to this reason, the action will be taken as per the submitted warranty letter, and the company will apply the required corrective and preventive actions.

## RECOMMENDATION FOR FAILURES

**Insulation Failure:** The defected section is recommended to be replaced, the replacement should be from joint to joint.

**Serving / Jacketing Failure:** If the water did not ingress through the cable, the jacket will be repaired using proper repairing techniques carried out by skilled technician. If the water came inside the cables to insulation, for cables suitable for wet location, practically dry the defected portion before repair.





## **NEWAGE QUALITY ASSURANCE**

In order to ensure the best quality assurance system, it is extremely desirable to test and inspect the product at each stage of manufacturing including raw materials and finished product.

### **Newage Cables have the following Quality Assurance System:**

- A. RAW MATERIALS INSPECTION**
- B. IN-PROCESS INSPECTION**
- C. FINISHED PRODUCT INSPECTION**

#### **RAW MATERIALS INSPECTION**

All the raw materials are procured only from internationally approved companies known for their quality products and once the material is received with their product certification, Newage Cables quality team tests and inspects the same again. Only those materials which meet Newage Cables internal standards are released for production.

#### **IN-PROCESS INSPECTION**

A team of well experienced and qualified personnel, dedicated to quality, inspects and test all the In-Process materials at every stage and materials complies to the specified requirements are only released for next process.

#### **FINISHED PRODUCT INSPECTION**

Newage Cables products before leaving factory undergo the entire applicable test according to the standard to which it is manufactured.

Routine tests are carried out for conformity to the specifications on 100% cable drums/Coils. Sample tests and type tests are carried out at regular intervals as per the applicable standards to conform the product quality.

## ORDERING INFORMATION

To serve our customer in minimum time and high efficiency, our valuable customers are requested to provide the following details along with their enquiries and orders:

1. Number of Phases / Cores.
2. Conductor required cross sectional area (conductor size along with size of neutral phase).
3. System Voltage.
4. Applicable customer specification or International Standard / Norm.
5. Conductor Material (Copper/Aluminum).
6. Insulation Material (PVC/PVC/LSZH).
7. Bedding / Inner Sheathing (Inner Jacketing (PVC/PE...)).
8. Armouring Type (SWA, AWA).
9. Cable Jacketing Material (PVC/MDPE/LSZH).
10. Cable special features required, e.g. Circular Conductors, Flame Retardant Type to IEC 60332-1, Anti-Termite.
11. Required length of cables (Drum Schedules).

## TECHNICAL ADVISORY SERVICES

For any specialist advice and assistance on the entire Newage product range contact the Technical Department.





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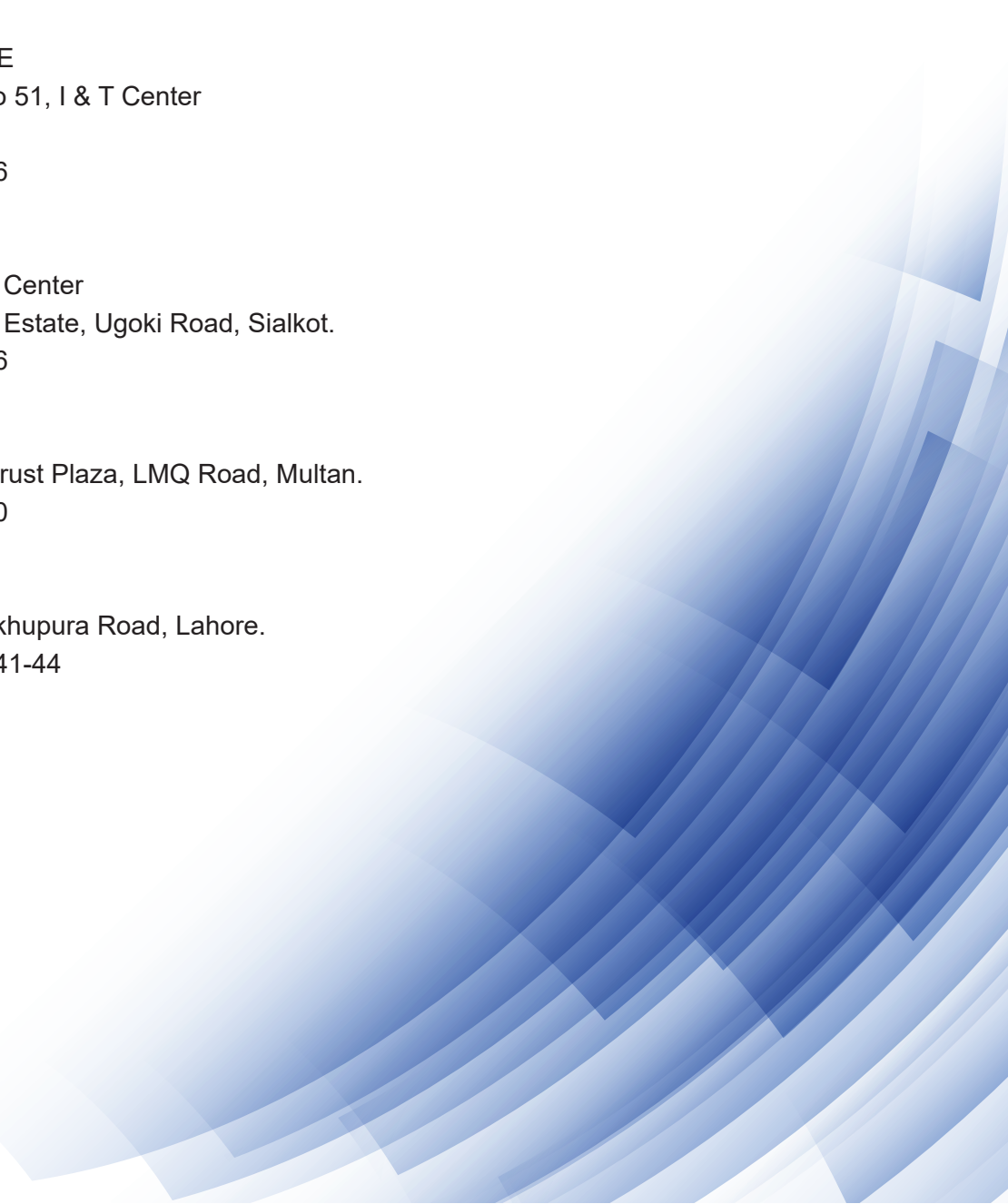
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