SECTION TWO
GENERAL TECHNICAL INFORMATION

INSTALLATION INFORMATION

General

All cables must be installed to comply with the latest New Zealand Wiring Regulations.

Moisture

Nexans cables are manufactured in conditions that exclude moisture, as it is difficult to remove from a finished cable. It is important that precautions are taken during installation to ensure that moisture is not permitted to enter the cable. Cut ends or opened areas must be protected from moisture at all times, including during pulling in. Cables, after cutting, must be re-sealed for storage, by an effective method such as a heat shrinkable cable cap.

Single Core Cables

The following points relating to single core cables should be noted:

1. Single core cables carrying the phase currents of a single circuit must be installed as closely as possible together, to minimise inductive reactance and voltage drop. The preferred formation for three phase conductors is a "trefoil" or cloverleaf pattern although flat touching formation is also acceptable. Sheaths should be in contact with one another in either case.

2. A single core cable generates an alternating magnetic field around itself which can cause large increases in voltage drop and power loss due to "transformer effect" when ferrous metal (iron and steel) is allowed to encircle the cable. Steel racking or ladder will not induce this effect, but the following must be observed:

a. Cable cleats may be of wood, plastic, or non-ferrous metal but steel saddles should not be used on single cores.
b. Where three single phase cables pass through a steel bulkhead, they must all pass through the same hole. Where glanding is required, it is usual to cut out a panel and replace this with a non-ferrous (metal or plastic) plate in which the three or four glands are mounted.

Cable Support

Under fault conditions, single core cables used as phase conductors in a multi-phase system may be subjected to large electromechanical forces which tend to drive them apart. Generally, properly designed cleats spaced at 1500 mm intervals will provide adequate support to the cable under normal operating conditions. However special consideration may be required if fault currents in excess of 15 kA are anticipated.

Green Goo

Also known as “Green Slime”, this phenomenon is characterised by the appearance of a sticky green exudate leaking out of PVC-insulated wiring at locations such as switches, hot points and light fittings. It is a common occurrence in both Australia and New Zealand.

The green goo problem is predominantly associated with older (25+ years) TPS-type cables operating in a warm environment. The exudate comprises a plasticiser that has migrated out of the PVC insulation, coloured due to reaction with the copper conductor, and that has subsequently travelled - by capillary action and/or gravity – along the conductor to emerge at a termination point.

Due to its stickiness and unsightly colour, the goo has a high nuisance value, however it poses no significant health hazard. It may be cleaned from surfaces by wiping with a rag soaked in a petroleum- or alcohol-based solvent (such as methalted spirits).

The long-term consequence of the exudate is that it represents a de-plasticising of the insulation, meaning that as the process continues, the PVC will eventually become brittle, and crack.

INSTALLATION INFORMATION (CONT.)

TPS Cables in Polystyrene Thermal Insulation

With the increasing use of polystyrene block insulation in houses, caravans and portable buildings, it is important to explain the potential problem that arises when PVC sheathed and insulated cables come into direct contact with this material.

The plasticiser that is added to PVC to make it flexible, has a tendency to migrate out of the PVC and into materials with which it is in contact, particularly where those materials – such as polystyrene and polyurethane - have a great affinity for the plasticiser. This will lead to the PVCs becoming progressively harder and more brittle, while in contrast the polystyrene will appear to "melt" as it absorbs the plasticiser.

The rate of migration is dependent upon the relative thickness of the materials, the temperature, and the amount of surface area in direct contact. Accordingly, the rate of deterioration of the PVC cable can vary considerably under different circumstances.

To mitigate the problem, it is recommended that the amount of direct contact between the cable and the polystyrene be reduced as much as possible. Effective ways of achieving this include positioning the cable with an air gap between the sheath and the polystyrene or installing the cable within a rigid PVC or PE conduit.

UV Resistance

Many polymers, due to their molecular structure, are prone to attack by UV radiation, and because of this will degrade upon continued exposure to sunlight, eventually cracking and splitting. The polyolefin family of materials, such as PE (including XLPE or X-90) and PP is particularly susceptible to deterioration in this manner. PVC is also at risk but noticeably less so, partly because of its structure but also due to the mitigating effects of the fillers, plasticisers and stabilisers that are compounded with it.

A simple, effective and cheap material that can be added to plastic compounds to absorb UV radiation is carbon black. However, while this approach is appropriate for sheathing materials, it is not necessarily so for insulating materials as the carbon masks the core colour.

Nexans recommends that the insulation of its cables be protected (covered) from solar radiation at all times, except in those instances where the material has been deliberately modified to guard against the effects of UV, eg, Aerial Bundled Cables (ABC). This covering may simply be the sheath of the cable.

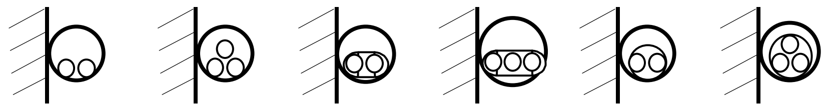
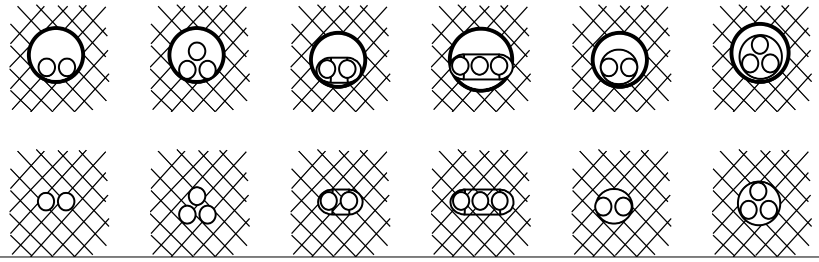
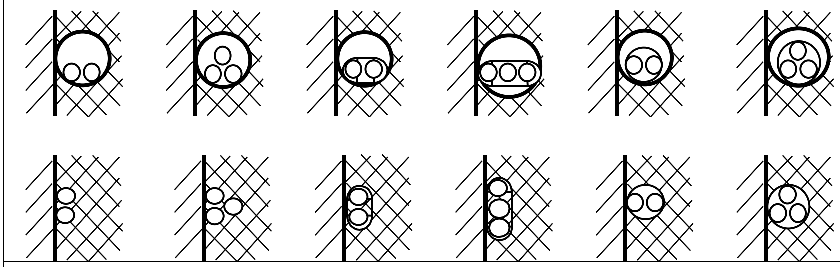
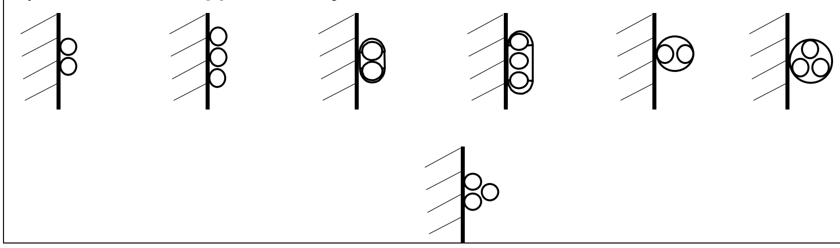
Lugs and Links

Stranded compacted conductors, either round or sector shaped, must have lugs and links fitted that are manufactured for the same nominal cross-sectional area as the conductor. For example, a 150 mm2 conductor must have a 150 mm2 lug or link fitted, and the correct dies, as stated by the manufacturer, used to compress it.

Although the lug or link will appear to be loose on the conductor, this is simply because the initial compression of the joint has already taken place during the manufacture of the conductor; the final compression of the joint will be correct.
If, for example, a 120 mm2 lug or link was fitted to a 150 mm2 conductor, the joint would be over-compressed and likely to fail in service. In addition, the smaller lug in itself would be unable to carry the same maximum current as the larger conductor, particularly with respect to fault currents.

Nexans manufactures conductors to be compatible with lugs and links normally available in New Zealand.

INSTALLATION METHODS

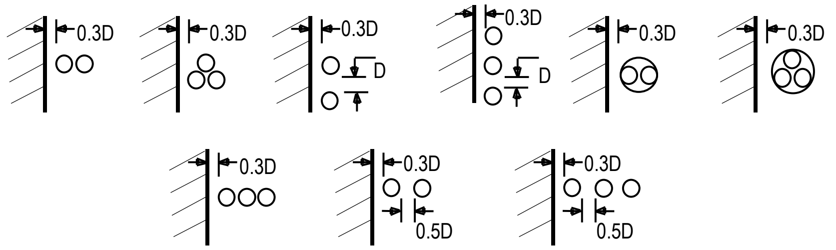
Figure 2.1 Graphical Representations of Methods of Installation	
a) Enclosed 	Cables installed in conduit or trunking or other similar enclosure.
b) Completely Surrounded by Thermal Insulation 	Cables either within an enclosure or unenclosed, completely surrounded by thermal insulation
c) Partially Surrounded by Thermal Insulation 	Cables either within an enclosure or unenclosed, partially surrounded by thermal insulation
d) Unenclosed, Clipped Directly to a Surface 	Cables installed directly in air, fixed to a wall, floor, ceiling1 or similar surface where air circulation around the cables is restricted.

Note: Refer to Table 2.1 for derating factors which apply for single circuits of cables installed under a ceiling or similar horizontal surface.

INSTALLATION METHODS (CONT.)

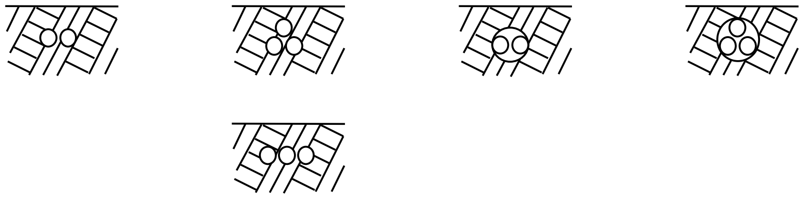
Figure 2.1 (cont.) Graphical Representations of Methods of Installation

e) Unenclosed, Spaced Away from a Surface[1]



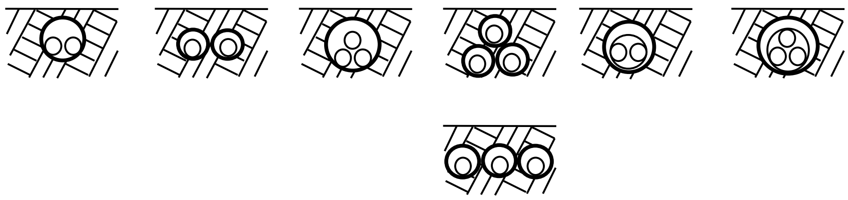
Cables installed with minimum spacings as shown directly in air, and supported on ladders2, racks, perforated3 or unperforated trays4 etc, or suspended from a catenary wire.

f) Buried Direct in the Ground



Cables buried directly in the ground. The depth of burial is measured from the surface to the centre of the cable or group of cables.

g) Laid in Underground Ducts, Pipes or Conduits



Cables installed in underground enclosures. The depth of burial is measured from the surface to the centre of the duct or group of ducts.

Notes:
1. D = Cable OD (or Width, in the case of a flat cable).
2. Ladder support is one where the supporting metalwork which provides impedance to air flow occupies less than 10% of the plan area under the cables.
3. Perforated trays are those in which not less than 30% of the surface area is removed by perforation.
4. Refer to Table 2.2 for derating factors which apply even for single circuits of cables installed on perforated or unperforated trays.
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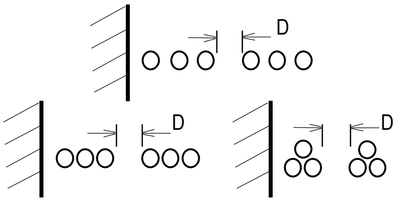
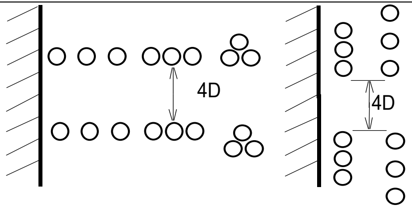
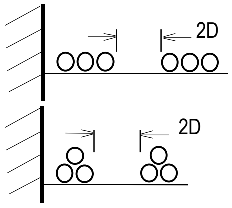
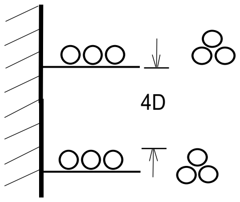
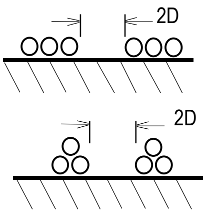
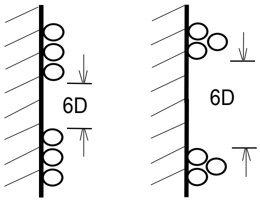
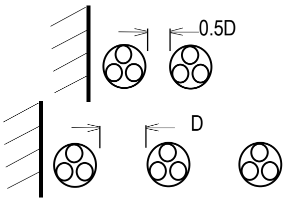
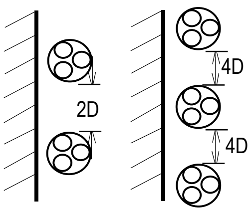
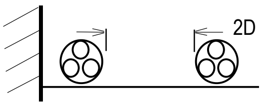
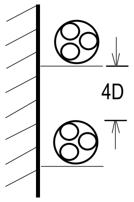
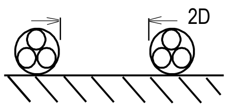
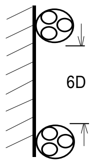
INSTALLATION METHODS (CONT.)

Figure 2.2 Minimum Spacings in Air to Avoid Derating		
Method of Installation	**Horizontal Spacings**	**Vertical Spacings**
a) Single Core Cables		
Cables spaced away from surfaces and supported on ladders, racks, etc. or suspended from a catenary wire, such that impedance to air flow around the cables is not greater than 10%.		
Cables spaced away from surfaces and supported on perforated or unperforated trays such that air flow around the cables is partially restricted.		
Cables fixed directly to a wall, floor, ceiling or similar surface such that air circulation is restricted.		
b) Multicore Cables		
Cables spaced away from surfaces and supported on ladders, racks, etc. or suspended from a catenary wire, such that impedance to air flow around the cables is not greater than 10%.		
Cables spaced away from surfaces and supported on perforated or unperforated trays such that air flow around the cables is partially restricted.		
Cables fixed directly to a wall, floor, ceiling or similar surface such that air circulation is restricted.		

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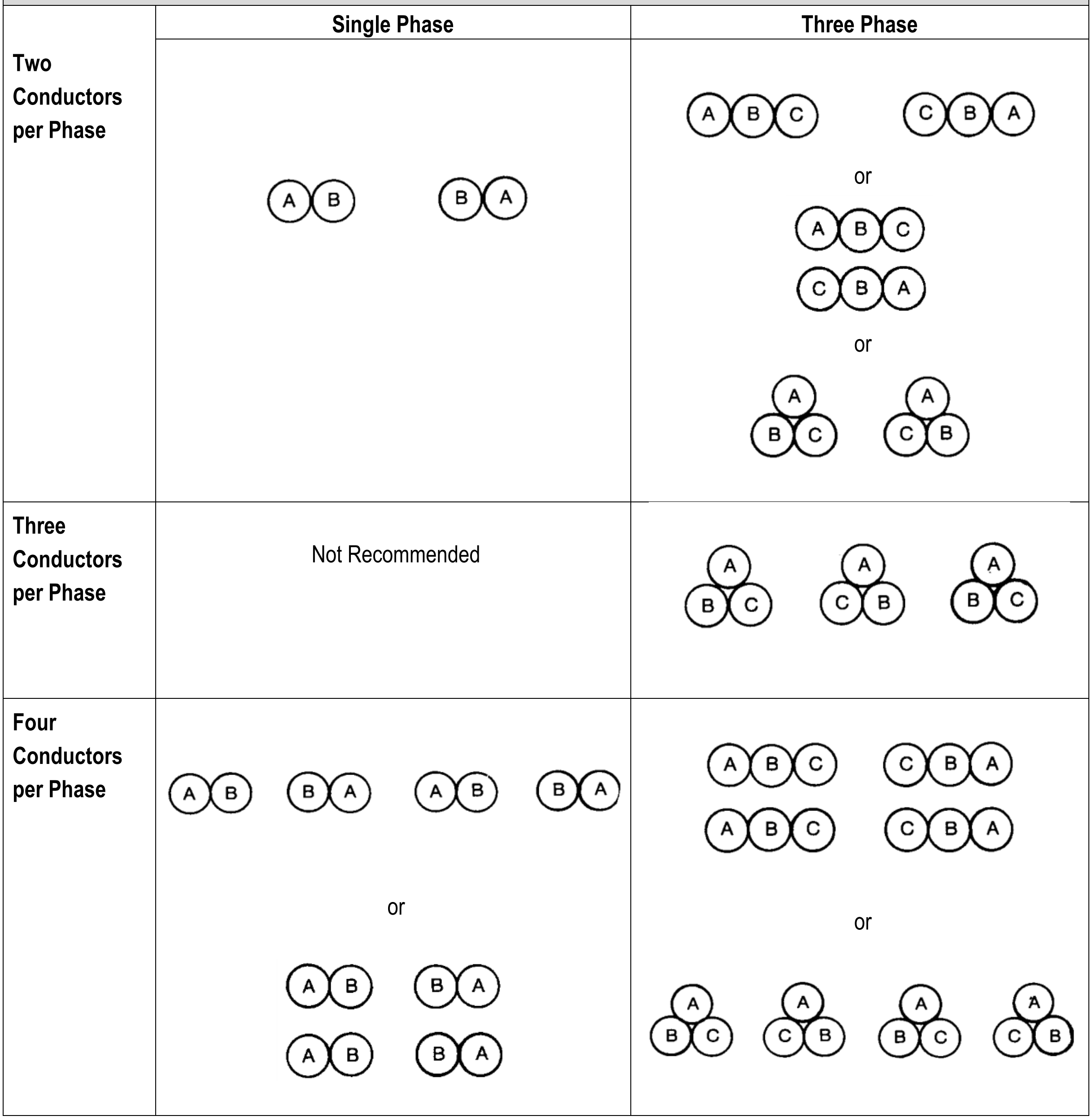
SINGLE CORE CABLES IN PARALLEL

The following are the recommended arrangements of single core cables in parallel. Non-symmetrical arrangements result in different impedances and hence unequal current sharing between parallel legs of the same phase. This should be avoided as it could lead to overheating of some cables.

Neutral conductors of Three phase circuits should be located so as not to disturb the symmetry of the groups.

Figure 2.3 Arrangements for Equal Current Sharing of Single Core Cables in Parallel



RATING FACTORS

Table 2.1 Bunched Circuits of Single Core or Multicore Cables in Air or in Wiring Enclosures

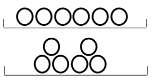
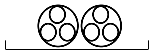
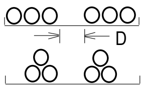
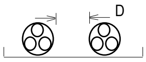
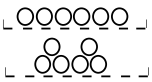
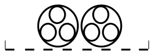
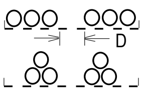
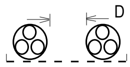
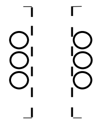
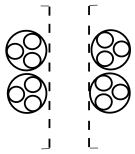
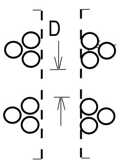
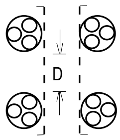
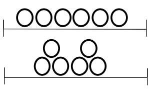
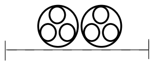
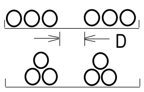
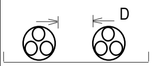
No of Circuits[1]	Arrangement of Cables					
	Bunched in Air	Bunched on a Surface or Enclosed	Single Layer on Wall or Floor		Single Layer under a Ceiling	
			Touching	Spaced[2,3]	Touching	Spaced[2,3]
1	1.00	1.00	1.00	1.00	0.95	0.95
2	0.87	0.80	0.85	0.94	0.81	0.85
3	0.75	0.70	0.79	0.90	0.72	0.85
4	0.72	0.65	0.75	0.90	0.68	0.85
5	0.70	0.60	0.73	0.90	0.66	0.85
6	0.67	0.57	0.72	0.90	0.64	0.85
7	-	0.54	0.72	0.90	0.63	0.85
8	-	0.52	0.71	0.90	0.62	0.85
9	-	0.50	0.70	0.90	0.61	0.85
10	-	0.48	0.70	0.90	0.61	0.85
12	-	0.45	0.70	0.90	0.61	0.85
14	-	0.43	0.70	0.90	0.61	0.85
16	-	0.41	0.70	0.90	0.61	0.85
18	-	0.39	0.70	0.90	0.61	0.85
20 or more	-	0.38	0.70	0.90	0.61	0.85

Notes:

1. Where a bunch of cables consist of n loaded conductors, it may be considered as n/2 circuits of two loaded conductors or n/3 circuits of three loaded conductors.
2. Spaced refers to a clearance of one cable diameter between adjacent cables.
3. Refer to Figure 2.2 for spacings which avoid derating.

RATING FACTORS (CONT.)

Table 2.2 Cables on Trays, Racks or Other Supports

Type of Support	Single Core Cables					Multicore Cables							
	Arrangement	No. of Trays or Racks	No. of Circuits[1] per Tray or Rack			Arrangement	No. of Trays or Racks	No of Cables[1] per Tray or Rack					
			1	2	3			1	2	3	4	6	9
Unperfor-ated Trays[2]		1	0.95	0.85	0.84		1	0.97	0.85	0.78	0.75	0.71	0.68
		2	0.92	0.83	0.79		2	0.97	0.84	0.76	0.73	0.68	0.63
		3	0.91	0.82	0.76		3	0.97	0.83	0.75	0.72	0.66	0.61
		1	0.98	0.96	0.94		1	0.97	0.96	0.94	0.93	0.90	-
		2	0.95	0.91	0.87		2	0.97	0.95	0.92	0.90	0.86	-
		3	0.94	0.90	0.85		3	0.97	0.94	0.91	0.89	0.84	-
Perforated Trays[2]		1	0.97	0.89	0.87		1	1.0	0.88	0.82	0.78	0.76	0.73
		2	0.94	0.85	0.81		2	1.0	0.87	0.80	0.76	0.73	0.68
		3	0.93	0.84	0.79		3	1.0	0.86	0.79	0.75	0.71	0.66
		1	1.0	0.98	0.96		1	1.0	1.0	0.98	0.95	0.91	-
		2	0.97	0.93	0.89		2	1.0	0.99	0.96	0.92	0.87	-
		3	0.96	0.92	0.86		3	1.0	0.98	0.95	0.91	0.85	-
Vertical Perforated Trays[3]		1	0.94	0.85	-		1	1.0	0.88	0.82	0.77	0.73	0.72
		2	0.92	0.83	-		2	1.0	0.88	0.81	0.76	0.72	0.70
		1	1.0	0.91	0.89		1	1.0	0.91	0.89	0.88	0.87	-
		2	1.0	0.90	0.86		2	1.0	0.91	0.88	0.87	0.86	-
Ladder Racks, Cleats etc[2]		1	1.0	0.95	0.94		1	1.0	0.87	0.82	0.80	0.79	0.78
		2	0.95	0.90	0.88		2	1.0	0.86	0.80	0.78	0.76	0.73
		3	0.95	0.89	0.85		3	1.0	0.85	0.79	0.76	0.73	0.70
		1	1.0	1.0	1.0		1	1.0	1.0	1.0	1.0	1.0	-
		2	0.97	0.95	0.93		2	1.0	0.99	0.98	0.97	0.96	-
		3	0.97	0.94	0.90		3	1.0	0.98	0.97	0.96	0.93	-

The factors are to be applied to "spaced from surface in air" current ratings.

Notes:
1. The factors given apply to circuits consisting of groups of two or three loaded single core cables or multicore cables having two or three loaded conductors.
2. Trays or ladder type supports shall have a vertical spacing of not less than 300 mm.
3. Back to back vertical trays shall have a horizontal spacing of not less than 230 mm.
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BENDING RADII AND DUCT SIZES

Recommended Bending Radius Factors

The safe bending radius for an electric cable is limited by the flexibility of its insulation and sheathing material. When a cable is being installed it may be pulled around several curves in different directions and subjected to dynamic stresses which could cause damage. Consequently, the bending radius around which a cable may be pulled is greater than that into which it can be set in its final position.

The following recommended minimum bending radii are expressed as a function of the cable diameter and refer to the inside of the curve. In all cases, bending radii should be as large as practicable.

Recommended Minimum Bending Radii			
Cable Type (choose the highest value of all relevant construction features)		**During Installation (F)**	**Set (F)**
All Cable Types	Nylon Covered	30	20
	HDPE Sheath	25	15
	Helical Copper or Brass taped	18	12
	Steel Wire Armoured	18	12
	Solid Aluminium Conductors	12	8
	Compacted or Shaped Stranded Conductors	12	8
MV XLPE Cables	Single Core and Multicore Cables	18	12
LV (0.6/1 kV) Cables	PVC/XLPE Insulation (Stranded conductor)	9	6
LV (0.6/1 kV) Cables	PVC/XLPE Insulation (Flexible conductor)	6	4

Minimum Bending Radius

R = F * D where, **R** = Bending Radius (mm), **D** = Cable Diameter (mm), and **F** = Factor from above table.

Duct Sizes

Ducts are another important consideration affecting the pulling operation. Selection of the appropriate duct should be based on internal duct diameter to suit a cable size and wall thickness to prevent deformation during duct installation. The internal finish of the installed ducting should be smooth to prevent cable sheath damage during installation. During cable installation, the use of graphite or other commercially available pulling lubricants can also prevent sheath damage and reduce pulling tensions. The following duct sizes are recommended:

Duct Selection			
Heavy Duty Rigid PVC Conduit	**Cable Diameter**		
Nominal Size (mm)	**Single Cable (mm)**	**Three Cables (mm)**	**Four Cables (mm)**
50	Up to 30	-	-
63	30 to 38	-	-
65	38 to 47	Up to 24	Up to 21
80	47 to 52	24 to 27	21 to 23
100	52 to 69	27 to 35	23 to 31
150	69 to 99	35 to 51	31 to 44
200	99 to 142	51 to 73	44 to 63
250	Above 142	Above 73	Above 63

PULLING TENSION

Where a cable is to be pulled in using a winch and steel wire rope, the rope may be secured to the cable by any of the following:

1. A cable stocking of steel wire braid
2. A pulling eye attached to the cable conductor
3. A pulling eye over the complete cable end
4. A pulling eye formed from the armour wires

The maximum tension which may be used is limited by the tensile strength of the conductors or armour wires, or by the gripping capability of the cable stocking, depending on the method used.

Stress Limits for Cable Materials	
Material	**Maximum Safe Tensile Stress (S) kN/mm^2**
Stranded Copper Conductor	0.07
Stranded Aluminium Conductor	0.05
Solid Aluminium Conductor	0.03
Galvanised Mild Steel Armour	0.13
Aluminium Wire Armour	0.04

Method of Calculation

Using values of S from table above:

Limited by Conductor

$$T_c = N * A_c * S$$

Where T_c = Maximum Pulling Tension (kN), N = No. of Conductors, A_c = Cross-sectional Area of one Conductor (mm2), and S = Maximum Safe Tensile Stress for Conductor (kN/mm2).

Limited by Armour

$$T_a = 2.47 * d_a * (D_a + d_a) * S$$

Where T_a = Maximum Pulling Tension (kN), S = Maximum Safe Tensile Stress for Armour (kN/mm2), d_a = Nominal Diameter of Armour Wire (mm), and D_a = Nominal Diameter under Armour (mm).

Limited by Stocking

$$T_s = 0.120 * D$$

Where T_s = Maximum Pulling Tension (kN), and D = the Overall Diameter of the Cable (mm).

Overall Limiting Tension	
Cable OD (mm)	**Maximum Pulling Tension (kN)**
0 to 15	5
15 to 25	10
25 to 50	15
50 and over	25

The safe pulling tension is the smallest of the calculated values.

SHORT CIRCUIT RATINGS

The short circuit capacity of a current carrying component of a cable is determined by the following factors:

1. The temperature prior to the short circuit, generally taken to be that corresponding with the maximum conductor operating temperature under normal conditions.
2. The energy produced by the short circuit, a function of both the magnitude and the duration of the current.
3. The limiting final temperature, generally determined by all materials in contact with the conducting component.

The adiabatic (no heat loss) equation for the temperature rise during a short circuit is as follows:

$$I^2 * t = k^2 * S^2$$

Where **I** = Short Circuit Current {r.m.s. over duration} (A.), **t** = Duration of Short Circuit (s), **k** = Constant depending on the material and the initial and final temperatures, and **S** = Cross-sectional Area of Current Carrying Component (mm2).
Rearrangement of the general equation gives the formulae for I_{SC} , the Short Circuit Rating for a particular Conductor Size, and for calculation of S_C , the Minimum Conductor Size to meet a specified short circuit level.

$$I_{SC} = \frac{k * S}{\sqrt{t}} \text{(A)}$$

$$S_C = \frac{I * \sqrt{t}}{k} (\text{mm}^2)$$ (Round up to the nearest standard conductor size.)

Values of **k** for Copper and Aluminium conductors and PVC and XLPE insulation materials, based on initial temperatures corresponding to the maximum continuous conductor operating temperatures are as follows:

Values of k for Cu and Al Conductors with PVC or XLPE Insulation				
Insulation Type	**Copper Conductor**		**Aluminium Conductor**	
	Up to 300 mm²	**Over 300 mm²**	**Up to 300 mm²**	**Over 300 mm²**
PVC*	111	98.7	73.6	65.3
XLPE#	143	143	94.5	94.5

* Insulation material temperature limits for PVC of 75°C to 160°C up to 300 mm2 and 75°C to 140°C above 300 mm2 apply.

Insulation material temperature limits for XLPE of 90°C to 250°C apply.

These values are based on the limits imposed by the insulation material alone. Note that soldered joints impose an upper temperature limit of 160°C, while for mechanical (bolted) joints the manufacturer's recommendations should be observed. The above temperature limits are appropriate for durations of up to 5 seconds only.

One Second Short Circuit Ratings

In practice it is often convenient to work with short circuit ratings converted to a one second basis. Reference may then be made to Table 2.3 which gives one second short circuit ratings for Copper and Aluminium conductors with PVC and XLPE insulation materials respectively.

To convert a one second rating to a rating for **t** seconds, divide by $\sqrt{t}$, eg, 34 kA for 1s equals 20 kA for 3s.

To convert a **t** second rating to a one second rating, multiply by $\sqrt{t}$, eg, 10 kA for 0.04s equals 2 kA for 1s.

Other Considerations

In addition to the temperature rise, consideration should also be given to the thermomechanical (longitudinal) and electromechanical (lateral) forces which can be generated under short circuit conditions.

CONDUCTOR SHORT CIRCUIT RATINGS

Table 2.3 Conductor Short Circuit Ratings (kA) for 1s Duration

Conductor Size (mm^2)	Copper Conductors		Aluminium Conductors	
	PVC Insulation	XLPE Insulation	PVC Insulation	XLPE Insulation
1	0.111	0.143	-	-
1.5	0.167	0.215	-	-
2.5	0.278	0.358	-	-
4	0.444	0.572	-	-
6	0.666	0.858	-	-
10	1.11	1.43	-	-
16	1.78	2.29	1.18	1.51
25	2.78	3.58	1.84	2.36
35	3.89	5.01	2.58	3.31
50	5.55	7.15	3.68	4.73
70	7.77	10.0	5.15	6.62
95	10.5	13.6	6.99	8.98
120	13.3	17.2	8.83	11.3
150	16.7	21.5	11.0	14.2
185	20.5	26.5	13.6	17.5
240	26.6	34.3	17.7	22.7
300	33.3	42.9	22.1	28.4
400	39.5	57.2	26.1	37.8
500	49.4	71.5	32.7	47.3
630	62.2	90.1	41.1	59.5
800	-	-	-	75.6
1000	-	-	-	94.5
1200	-	-	-	113.4

Note: Short circuit ratings for durations other than one second may be obtained by dividing the one second ratings by $\sqrt{t}$, where **t** is the required duration in seconds.

STRANDED CONDUCTOR MAX DC RESISTANCES

Table 2.4 Stranded Conductor Maximum DC Resistances at 20°C (Ω/km)

Conductor Size (mm²)	Plain Annealed Copper	Tinned Annealed Copper	Aluminium
1	18.1	18.2	-
1.5	13.6	13.8	-
2.5	7.41	7.56	-
4	4.61	4.70	-
6	3.08	3.11	-
10	1.83	1.84	-
16	1.15	1.16	1.91
25	0.727	0.734	1.20
35	0.524	0.529	0.868
50	0.387	0.391	0.641
70	0.268	0.270	0.443
95	0.193	0.195	0.320
120	0.153	0.154	0.253
150	0.124	0.126	0.206
185	0.0991	0.100	0.164
240	0.0754	0.0762	0.125
300	0.0601	0.0607	0.100
400	0.0470	0.0475	0.0778
500 *	0.0366	0.0369	0.0605
630 *	0.0283	0.0286	0.0469
800	-	-	0.0367
1000	-	-	0.0291
1200	-	-	0.0247

Notes:

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2. Values for hard drawn plain or hard drawn tinned copper conductors may be obtained by **dividing** the values for annealed conductors by 0.97.
3. The above values are for Class 2 stranded conductors except for 1 mm² which is Class 1.
4. Conductor sizes marked with an * are for single core cables only. For multi core cables multiply value by 1.02.
5. 1200mm² Aluminium resistance value taken from IEC 60228.

FLEXIBLE CONDUCTOR MAX DC RESISTANCES

Table 2.5 Flexible Conductor Maximum DC Resistances at 20°C (Ω/km)

Conductor Size (mm²)	Plain Annealed Copper	Tinned Annealed Copper	Maximum Diameter of wires Class 5	Maximum Diameter of wires Class 6
0.5	39.0	40.1	0.21	0.16
0.75	26.0	26.7	0.21	0.16
1	19.5	20.0	0.21	0.16
1.5	13.3	13.7	0.26	0.16
2.5	7.98	8.21	0.26	0.16
4	4.95	5.09	0.31	0.16
6	3.30	3.39	0.31	0.21
10	1.91	1.95	0.41	0.21
16	1.21	1.24	0.41	0.21
25	0.780	0.795	0.41	0.21
35	0.554	0.565	0.41	0.21
50	0.386	0.393	0.41	0.31
70	0.272	0.277	0.51	0.31
95	0.206	0.210	0.51	0.31
120	0.161	0.164	0.51	0.31
150	0.129	0.132	0.51	0.31
185	0.106	0.108	0.51	0.41
240	0.0801	0.0817	0.51	0.41
300	0.0641	0.0654	0.51	0.41
400	0.0486	0.0495	0.51	-
500	0.0384	0.0391	0.61	-
630	0.0287	0.0292	0.61	-

Notes:

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STRANDED CONDUCTOR DIMENSIONS

Table 2.6 Copper Conductor Dimensions

Nominal Cross Sectional Area (mm²)	Circular Nominal Diameter (mm)	Compacted Minimum Diameter (mm)	Three Core, 120° Sectored		Four Core, 90° Sectored	
			Nominal Depth (mm)	Max Width (mm)	Nominal Depth (mm)	Max Width (mm)
16	4.95	4.85	-	-	-	-
25	6.30	5.90	5.22	8.48	5.87	7.68
35	7.55	6.95	5.97	9.85	6.91	9.20
50	8.75	8.20	7.02	11.51	7.97	10.50
70	10.50	9.69	8.50	14.40	9.37	13.09
95	12.40	11.40	10.02	17.00	10.97	15.55
120	14.10	12.81	11.22	18.90	12.25	17.10
150	15.55	14.22	12.17	20.90	13.62	18.92
185	17.40	15.97	13.65	23.10	15.37	21.30
240	20.00	18.25	15.57	26.75	17.48	24.50
300	22.35	20.47	17.67	29.85	19.57	27.60
400	25.25	23.40	19.84	33.96	22.29	31.21
500	28.30	26.76	-	-	-	-
630	-	30.44	-	-	-	-

Table 2.7 Aluminium Conductor Dimensions

Nominal Cross Sectional Area (mm²)	Circular Nominal Diameter (mm)	Compacted Minimum Diameter (mm)	Three Core, 120° Sectored		Four Core, 90° Sectored	
			Nominal Depth (mm)	Max Width (mm)	Nominal Depth (mm)	Max Width (mm)
16	5.15	-	-	-	-	-
25	6.30	5.99	5.22	8.48	5.87	7.68
35	7.60	6.88	5.97	9.85	6.91	9.20
50	8.80	8.20	7.02	11.51	7.97	10.50
70	10.45	9.69	8.50	14.40	9.37	13.09
95	12.40	11.40	10.02	17.00	10.97	15.55
120	14.15	12.81	11.22	18.90	12.25	17.10
150	15.60	14.22	12.17	20.90	13.62	18.92
185	17.35	15.90	13.65	23.10	15.17	21.30
240	20.25	18.15	15.57	26.75	17.48	24.50
300	22.50	20.30	17.67	29.85	19.57	27.60
400	25.40	22.90	19.84	33.96	22.29	31.21
500	28.55	26.10	-	-	-	-
630	-	29.70	-	-	-	-
800	-	33.80	-	-	-	-
1000	-	38.10	-	-	-	-
1200	-	41.20	-	-	-	=

Note: Lugs and links must always be selected to match the nominal cross-sectional area of the conductor. A lug or link for a 185mm² circular conductor may fit on a 240 mm² compacted conductor but may not be rated to carry the load current associated with the larger conductor size; nor will it compress correctly if it is of the compression type.

WIRE AND CABLE SIZE COMPARISON

British Imperial		Equivalent Metric	Metric Size	American Wire
Number/Diameter of Wires Nº/inch	Nominal C/S Area sq inch	C/S Area mm²	mm²	Gauge AWG
		0.205		24
			0.22	
		0.324		22
			0.35	
			0.5	
		0.519		20
			0.75	
		0.826		18
1/0.044	0.0015	0.97		
			1	
3/0.029	0.0019	1.25		
		1.31		16
			1.5	
3/0.036	0.003	1.93		
		2.08		14
			2.5	
7/0.029	0.0045	2.93		
		3.31		12
			4	
7/0.036	0.007	4.52		
		5.26		10
			6	
		6.63		9
7/0.044	0.010	6.75		
		8.37		8
7/0.052	0.0146	9.43		
			10	
		10.6		7
		13.3		6
7/0.064	0.0225	14.3		
		16.8		5
			16	
19/0.044	0.03	18.3		
		21.1		4
			25	
19/0.052	0.04	25.5		
		26.7		3
		33.6		2
			35	
19/0.064	0.06	38.7		
		42.4		1
			50	
		53.5		1/0
19/0.083	0.10	65.1		
		67.4		2/0
			70	
37/0.064	0.12	75.3		
		85.0		3/0
			95	
37/0.072	0.15	95.3		
		107		4/0
			120	
37/0.083	0.20	127		

WIRE AND CABLE SIZE COMPARISON (CONTINUED)

British Imperial		Equivalent Metric	Metric Size	American Wire Gauge
Number/Diameter of Wires Nº/inch	Nominal C/S Area sq inch	C/S Area mm²	mm²	kcmil
			120	
37/0.083	0.20	127		
		127		250
			150	
		152		300
37/0.093	0.25	159		
		177		350
			185	
37/0.103	0.30	195		
		203		400
		228		450
			240	
		253		500
61/0.093	0.40	262		
		279		550
			300	
		304		600
61/0.103	0.50	322		
		329		650
		355		700
		380		750
91/0.093	0.60	391		
			400	800
		405		800
		456		900
91/0.103	0.75	480		
			500	
		507		1000
			630	
127/0.103	1.00	669		

Note: 1mm² = 1,973.5 circular mils = 1.9735 kcmils.