OLENZ
OVERHEAD LINE ENGINEERING

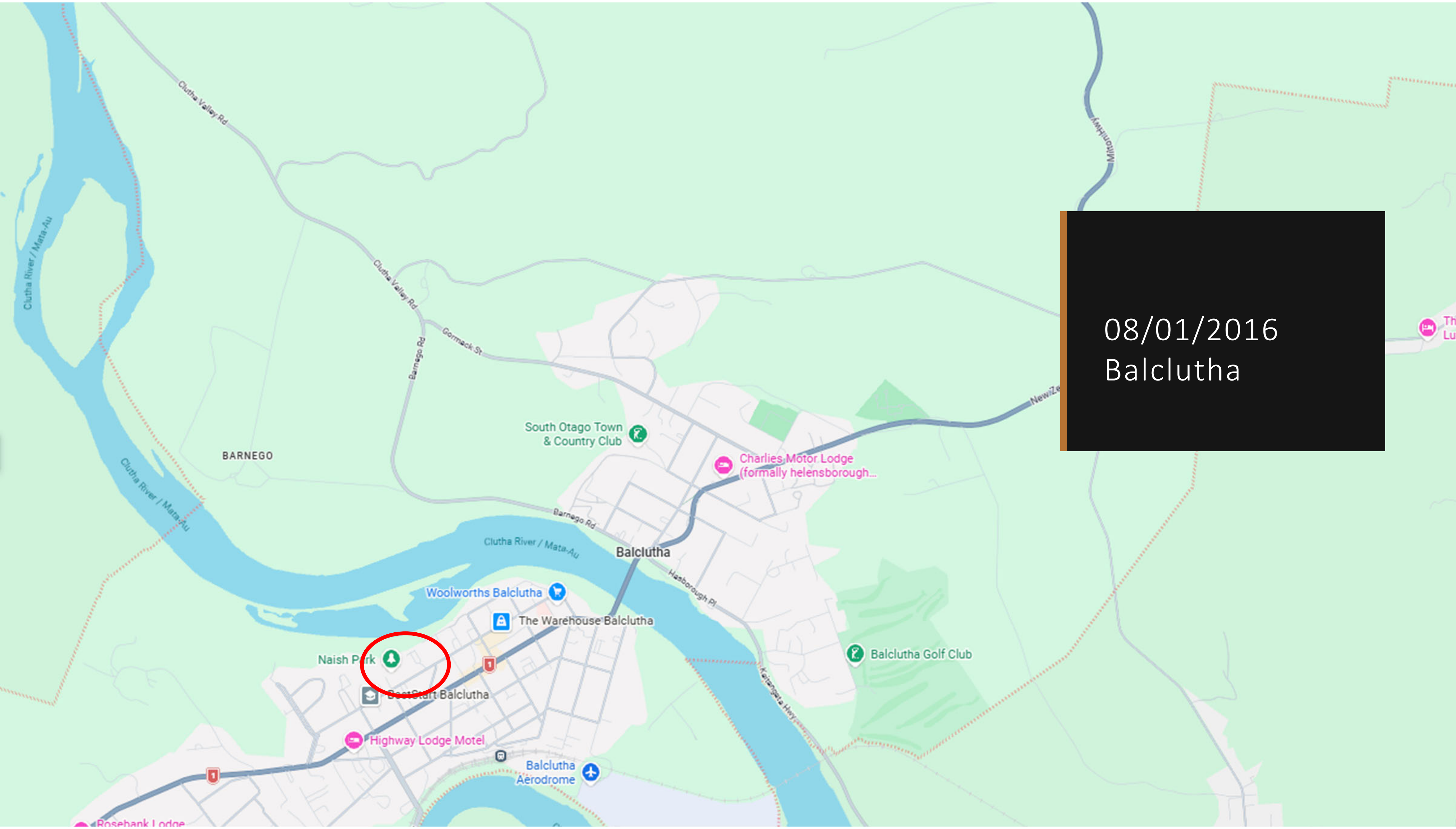
EEA – Line Designer's Forum - 2026

Clearances between circuits on the same poles

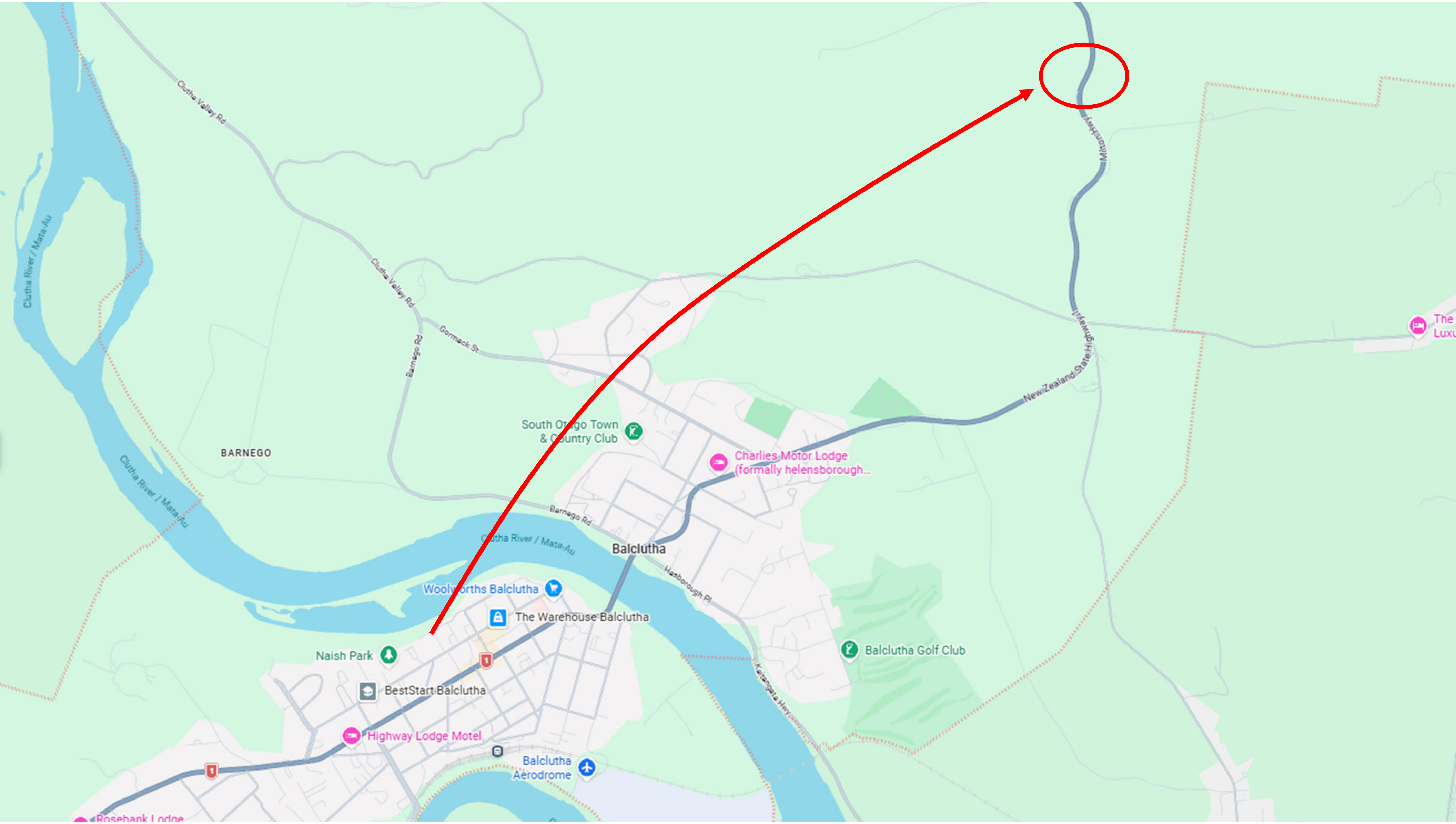
The untold story of how and why k = 0.6 = \[starburst\] and how to avoid it

PRESENTED BY

Carl Rathbone - 20/05/2026



08/01/2016
Balclutha



Clutha Valley Rd
Clutha River / Mata-Au
Barnego Rd
Gormack St
BARNEGO
South Otago Town & Country Club
Charlies Motor Lodge (formally helensborough...
Milton Hwy
New Zealand State Highway 1
Balclutha
Hasborough Pl
Woolworths Balclutha
The Warehouse Balclutha
Naish Park
BestStart Balclutha
Highway Lodge Motel
Balclutha Aerodrome
Balclutha Golf Club
Kaitangata Hwy
Rosebank Lodge


HEAVY TRAX HIRE
SAKAI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OLENZ — OVERHEAD LINE ENGINEERING

Milton-Balclutha 66kV/11kV line

Poles

Ingal 12.5m Steel poles
Vertical spacing between attachments = 2.2m

66kV circuit

- Nitrogen conductor
- 5.08kN Horizontal tension (9.2% CBL)
- 3.52m sag

Span

Length = 142.2m

11kV Circuit

- Helium conductor
- 1.51kN Horizontal tension (9.6% CBL)
- 3.45m sag

Wind direction
HEAVY TRAX HIRE
SAKAI


Span position
Wind direction
Southern Scenic Rte

3.7.3 Conductors on the same supports (same or different circuits and shared spans)

3.7.3.1 *General*

This Clause provides the minimum requirements between conductors or cables attached to the same support, and sharing the same span to prevent circuit-to-circuit or phase-to-phase flashover under operating conditions.

Where conductors or cables are carried on the same pole or support as those of a higher voltage the lower voltage conductors shall be placed below the higher voltage conductors, or beside in the case of vertical circuit construction.

Any two bare conductors having a difference in voltage with respect to each other shall have vertical, horizontal or angular separation from each other in accordance with the values required by Clause 3.7.3.2 (See Figure 3.5), provided that the clearance at the support or at any part in the span is not less than the separation nominated in Item (b) (See Figure 3.6).

The separation given by Clause 3.7.3.2 is intended to cater for differential (out of phase and in phase) movement of conductors under wind conditions with minimum turbulence. The separation given by Clause 3.7.3.3 is a minimum under any circumstances.

3.7.3.2 *At mid span*

The mid span conductor separation for a single circuit can be determined using Equation 3.1and Figure 3.5.

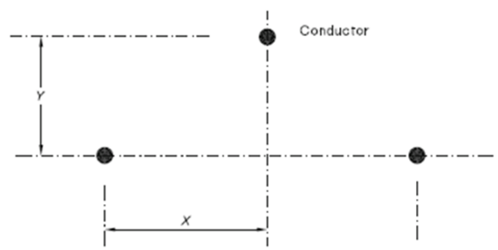


FIGURE 3.5 CONDUCTOR SEPARATION AT MID SPAN (ONE CIRCUIT)

$$\sqrt{X^2+(1.2Y)^2} \geq \frac{U}{150}+k\sqrt{D+l_i} \quad \ldots 3.1$$

where

X = is the projected horizontal distance in metres between the conductors at mid span; ($X = (X_1 + X_2)/2$) where X_1 is the projected horizontal distance between the conductors at one support and X_2 is the projected horizontal distance between the conductors at the other support in the same span

Y = is the projected vertical distance in metres between the conductors at mid span; ($Y = (Y_1 + Y_2)/2$) where Y_1 is the projected vertical distance between the conductors at one support and Y_2 is the projected vertical distance between the conductors at the other support in the same span

U = is the r.m.s. vector difference in potential (kV) between the two conductors when each is operating at its nominal voltage. In determining the potential between conductors of different circuits or between an earthwire and an aerial phase conductor, regard shall be paid to any phase differences in the nominal voltages

k = is a constant, normally equal to 0.4. Where experience has shown that other values are appropriate, these may be applied. See Note 5 to Figure 3.6.

D = is the greater of the two conductor sags in metres at the centre of an equivalent level span and at a conductor temperature with electrical load (typically 50°C in still air). This may be higher for high temperature conductors

l = is the length in metres of any free swing suspension insulator associated with either conductor. Zero for pin and post insulators

For the purposes of this Clause an equivalent level span shall mean a span—

(a) which has the same span length in the horizontal projection as the original span;

(b) in which conductor attachments at supports are in the same horizontal plane; and

(c) in which the horizontal component of the conductor tension is the same as in the original span.

As this Equation 3.1 is intended to cater for out-of-phase movement of conductors under wind conditions with minimum turbulence, the conductor sags are calculated at 50°C and the effect of different load currents is ignored (because of the significant cooling effect of the wind in these conditions). The wind is not sufficient to increase the sag, and therefore sag can be calculated assuming still air.

U can be determined by using the formula—

$$U = \sqrt{V_a^2 + V_b^2 - 2V_aV_b\cos\phi} \quad \ldots 3.2$$

where

V_a = upper circuit nominal voltage phase to earth value (kV)

V_b = lower circuit nominal voltage phase to earth value (kV)

ϕ = phase angle difference between circuits (degrees)

3.7.3.3 *At any point in the span (vertical)*

Where $U \leq 11$ kV........................... 0.38 m

Where $U > 11$ kV........................... $(0.38 + q\,(U - 11))$ . . . 3.3

where

q = constant which varies from 0.005 to 0.01 (normal). Where regional service experience has shown that other values are appropriate, these may be applied

(b) At any point in the span

Where U ≤ 11 kV . . . . 0.38 m

Where U > 11 kV . . . . (0.38 + 0.01 (U − 11))

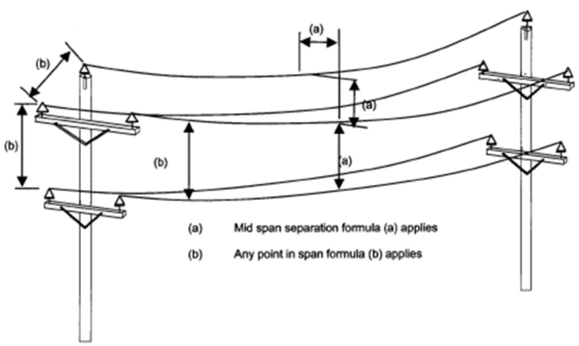


FIGURE 10.4.1 CONDUCTOR SEPARATION—ATTACHED ON SAME STRUCTURE

NOTES:

1 When conductors of different circuits are located vertically one above the other, consideration should be given to the need to prevent clashing of conductors of different circuits under the influence of load current in one or both circuits. Refer to Figure 10.4.2.

2 This Clause is not intended to apply to insulated conductors (with or without earthed screens) of any voltage.

3 The spacing for covered conductors may be reduced providing the covering is adequate to prevent electrical breakdown of the covering when the conductors clash and a risk management strategy is in place to ensure that conductors do not remain entangled for periods beyond that the covering can withstand.

4 Where spacers are used, spacing may be less than those specified. It is suggested that the spacer be taken to be a conductor support for the purpose of calculating conductor spacing.

5 The above empirical formula is intended to minimize the risk of conductor clashing; however, circumstances do arise where it is not practicable to give guidance or predict outcomes. Some of these situations involve:

(a) Extremely turbulent wind conditions.

(b) The different amount of movement of conductors of different size and type under the same wind conditions.

(c) Conductor movement under fault conditions (particularly with horizontal construction).

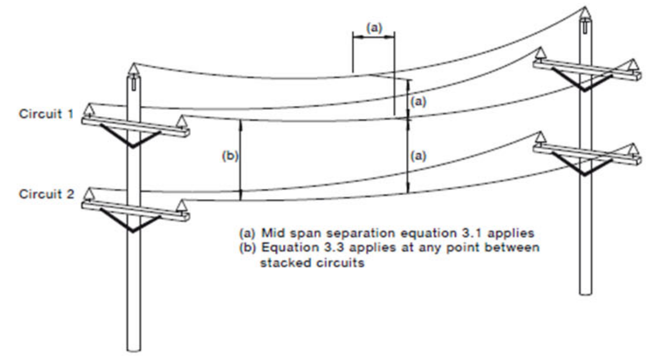


FIGURE 3.6 MINIMUM CONDUCTOR SEPARATION—ATTACHED ON SAME STRUCTURE

NOTES:

1 When conductors of different circuits are located vertically one above the other, consideration should be given to the need to prevent clashing of conductors of different circuits under the influence of load current in one or both circuits. (See Figure 3.7).

2 This Clause is not intended to apply to insulated conductors (with or without earthed screens) of any voltage.

3 The spacing for covered conductors may be reduced provided the covering is adequate to prevent electrical breakdown of the covering when the conductors clash and a risk management strategy is in place to ensure that conductors do not remain entangled for periods beyond what the covering can withstand.

4 Where phase spacers are used, separation may be less than those specified. It is suggested that the spacer be taken to be a conductor support for the purpose of calculating conductor spacing.

5 Empirical formula 3.1 is intended to minimize the risk of conductor clashing; however, circumstances do arise where it is not practicable to give guidance or predict outcomes. Some of these situations involve—

(a) extremely turbulent wind conditions;

(b) the different amount of movement of conductors of different size and type under the same wind conditions; and

(c) conductors movement under fault conditions (particularly with horizontal construction).

The following k factors are recommended for overhead power lines which have phase-to-phase clearances at 1200 mm or less at midspan:

(i) Extremely turbulent wind conditions—k to be in range 0.4 to 0.6.

(ii) High to extreme bushfire prone areas—k to be in range 0.4 to 0.6.

(iii) Under high phase-to-phase fault conditions—k = 0.4 for fault currents up to 4,000 A, 0.5 for fault currents from 4,000 A to 6,000 A and 0.6 for fault currents above 6,000 A.

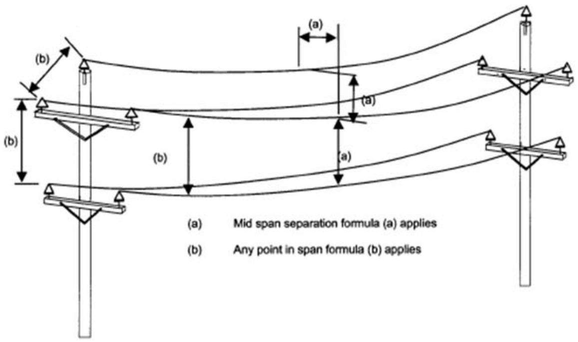
(iv) Conductors of different mass/diameter ratios and at different attachment heights—k = 0.4 to 0.6.

In all other situations a k factor of 0.4 is recommended.

(b) At any point in the span

Where U ≤ 11 kV . . . . 0.38 m

Where U > 11 kV . . . . (0.38 + 0.01 (U − 11))



circuits under the influence of load current in one or both circuits. Refer to Figure 10.4.2.

2 *This Clause is not intended to apply to insulated conductors (with or without earthed screens) of any voltage.*

3 *The spacing for covered conductors may be reduced providing the covering is adequate to prevent electrical breakdown of the covering when the conductors clash and a risk management strategy is in place to ensure that conductors do not remain entangled for periods beyond that the covering can withstand.*

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5 *The above empirical formula is intended to minimize the risk of conductor clashing; however, circumstances do arise where it is not practicable to give guidance or predict outcomes. Some of these situations involve:*

(a) Extremely turbulent wind conditions.

(b) The different amount of movement of conductors of different size and type under the same wind conditions.

(c) Conductor movement under fault conditions (particularly with horizontal construction).

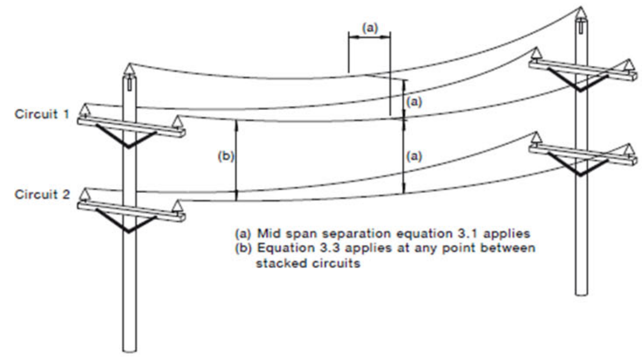

FIGURE 3.6 MINIMUM CONDUCTOR SEPARATION—ATTACHED ON SAME STRUCTURE

NOTES:

1 When conductors of different circuits are located vertically one above the other, consideration should be given to the need to prevent clashing of conductors of different circuits under the influence of load current in one or both circuits. (See Figure 3.7).

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The following k factors are recommended for overhead power lines which have phase-to-phase clearances at 1200 mm or less at midspan:

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(ii) High to extreme bushfire prone areas—k to be in range 0.4 to 0.6.

(iii) Under high phase-to-phase fault conditions—$k = 0.4$ for fault currents up to 4,000 A, 0.5 for fault currents from 4,000 A to 6,000 A and 0.6 for fault currents above 6,000 A.

(iv) Conductors of different mass/diameter ratios and at different attachment heights—$k = 0.4$ to 0.6.

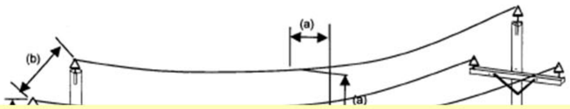
In all other situations a k factor of 0.4 is recommended.

(b) the different amount of movement of conductors of different size and type under the same wind conditions; and

(b) At any point in the span

Where U ≤ 11 kV . . . . 0.38 m

Where U > 11 kV . . . . (0.38 + 0.01 (U − 11))



The following k factors are recommended for overhead power lines which have phase-to-phase clearances at 1200 mm or less at midspan:

(i) Extremely turbulent wind conditions—*k* to be in range 0.4 to 0.6.

(ii) High to extreme bushfire prone areas—*k* to be in range 0.4 to 0.6.

(iii) Under high phase-to-phase fault conditions—*k* = 0.4 for fault currents up to 4,000 A, 0.5 for fault currents from 4,000 A to 6,000 A and 0.6 for fault currents above 6,000 A.

(iv) Conductors of different mass/diameter ratios and at different attachment heights—*k* = 0.4 to 0.6.

In all other situations a *k* factor of 0.4 is recommended.

4 Where spacers are used, spacing may be less than those specified. It is suggested that the spacer be taken to be a conductor support for the purpose of calculating conductor spacing.

5 The above empirical formula is intended to minimize the risk of conductor clashing; however, circumstances do arise where it is not practicable to give guidance or predict outcomes. Some of these situations involve:

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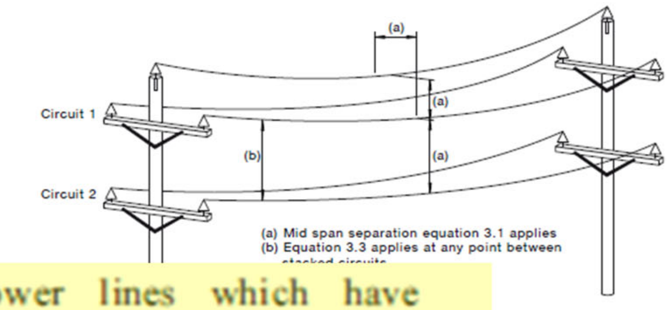
(b) The different amount of movement of conductors of different size and type under the same wind conditions.

(c) Conductor movement under fault conditions (particularly with horizontal construction).



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(iii) Under high phase-to-phase fault conditions—*k* = 0.4 for fault currents up to 4,000 A, 0.5 for fault currents from 4,000 A to 6,000 A and 0.6 for fault currents above 6,000 A.

(iv) Conductors of different mass/diameter ratios and at different attachment heights—*k* = 0.4 to 0.6.

In all other situations a *k* factor of 0.4 is recommended.

6 *The following situations may also need to be taken into account when considering spacing of conductors but it is not practicable to provide guidance in this document. Knowledge of local conditions would be required to make design decisions.*

(a) *Aircraft warning devices.*

(b) *Large birds which may collide with conductors, causing them to come together, or whose wingspan is such as to make contact between bare conductors and conducting crossarms.*

(c) *Flocks of birds resting on conductors are known to 'lift off' simultaneously, causing violent conductor movement.*

(d) *Ice loading and ice shedding.*

(e) *Terrain factors that may contribute to aerodynamic lift and/or random motion.*

(f) *Spray irrigators.*

7 *Spacing may need to be increased in locations where bridging of the spacing by birds or animals is experienced or probable.*

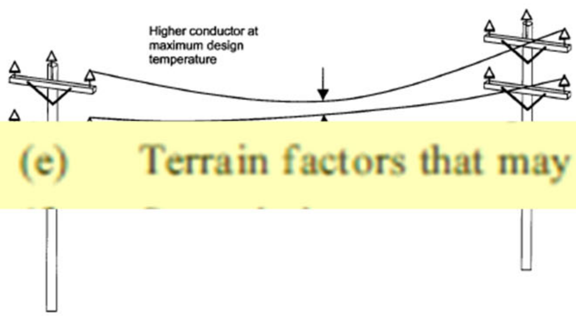


FIGURE 10.4.2 CONDUCTOR SEPARATION—INFLUENCE OF LOAD CURRENT—ATTACHED ON SAME STRUCTURE

10.4 AIR GAP CLEARANCES ON STRUCTURES

10.4.1 General

The purpose of this Clause is to provide guidelines on the separation required between aerial conductors or cables and any earthed structure to prevent contact under normal operating conditions.

This Clause applies to all transmission and distribution lines using bare aerial conductors and suspension insulators. It is intended to provide guidance in the selection of suitable air gap clearances between conductors and the structure. Guidance in the selection of solid insulation levels is not covered here and should be considered separately.

Insulation at the structure is provided by a combination of solid insulators such as porcelain, glass or other composite materials and also by wood crossarms, air, or a combination of these. This insulation is subjected to electrical stresses resulting from power frequency voltages, switching surges and lightning impulse voltages.

(e) Terrain factors that may contribute to aerodynamic lift and/or random motion.

6 Mid span clearances may need to be increased in situations where the conductor transition from horizontal to vertical or where the adjacent conductors are of different characteristics (diameter, weight) which can cause out of phase movement.

7 The following situations may also need to be taken into account when considering spacing of conductors but it is not practicable to provide guidance in this document. Knowledge of local conditions would be required to make design decisions. The situations are as follows:

(a) Aircraft warning devices.

(b) Large birds which may collide with conductors, causing them to come together, or whose wingspan is such as to make contact between bare conductors and conducting cross-arms.

(c) Flocks of birds resting on conductors are known to 'lift off' simultaneously, causing excessive conductor movement.

(d) Ice and snow loading and ice shedding.

(e) Terrain factors that may contribute to aerodynamic lift and/or random motion.

(f) Spray irrigators.

(g) Safety approach clearances for construction, operation and maintenance.

(h) Fire prone areas (e.g. burning of sugar cane trash) where ionized air will have a reduced dielectric strength.

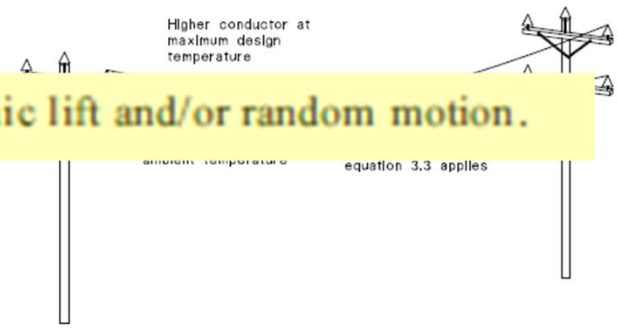
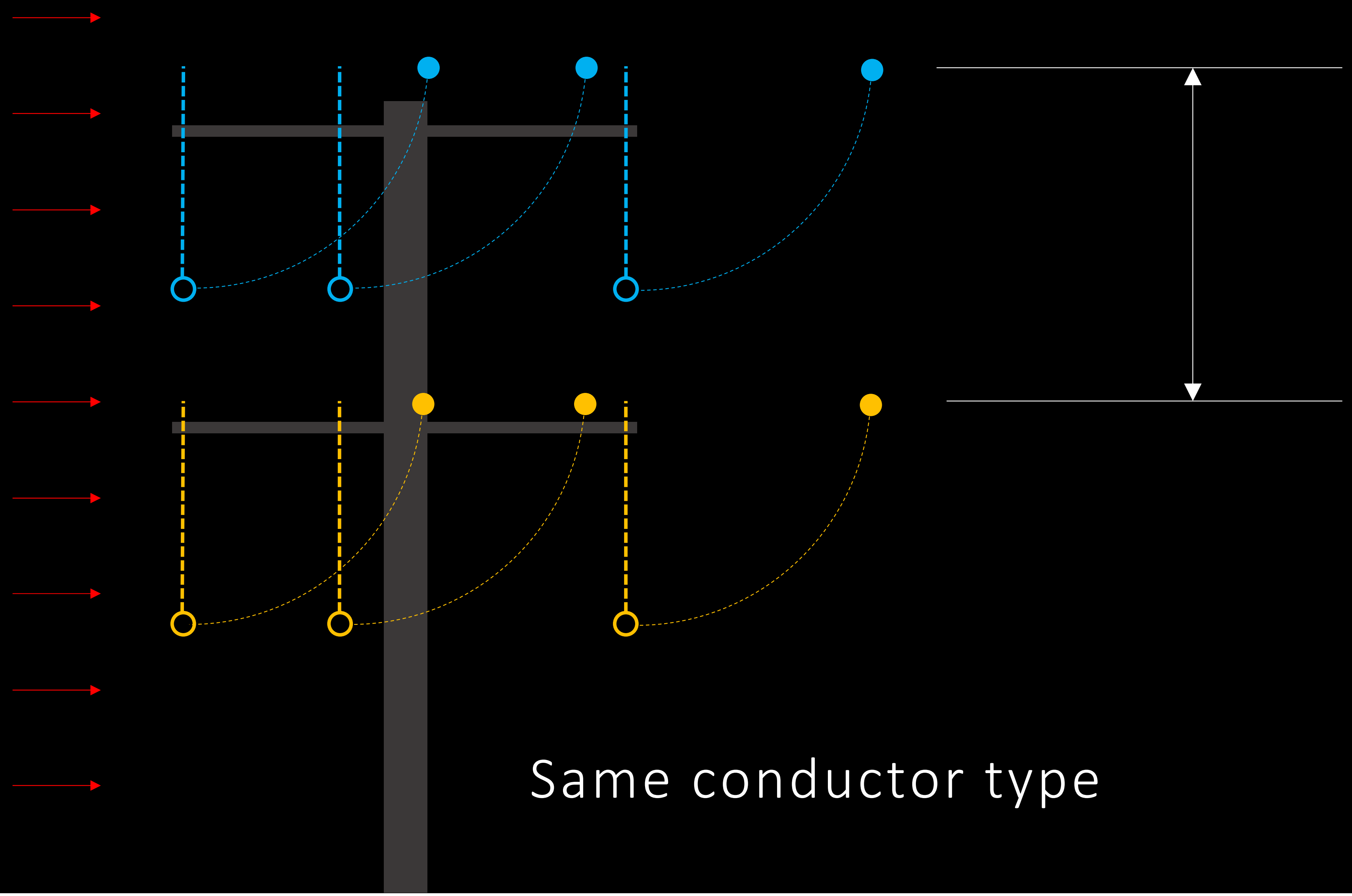


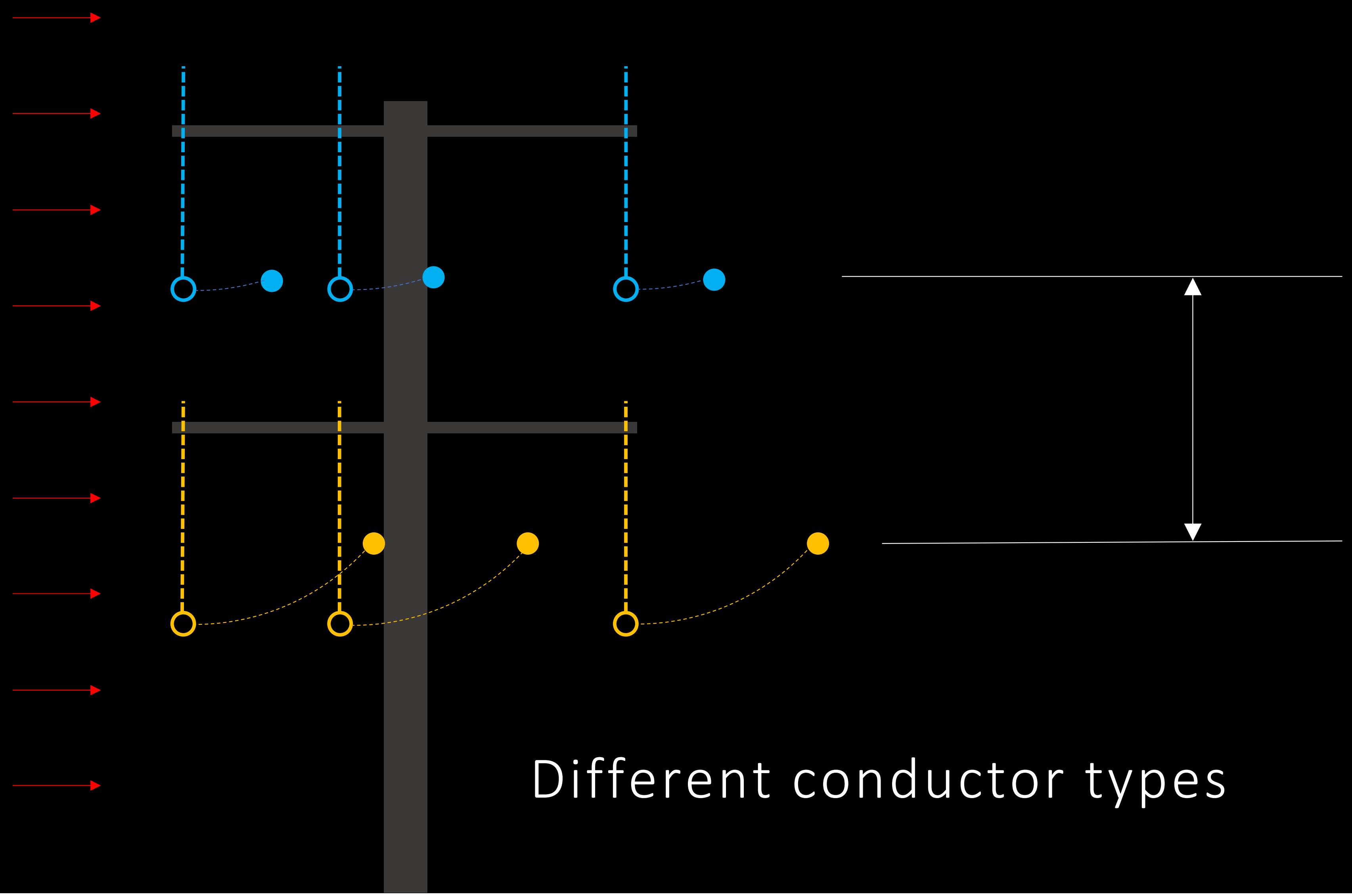
FIGURE 3.7 CONDUCTOR SEPARATION—INFLUENCE OF LOAD CURRENT—ATTACHED ON SAME STRUCTURE

3.7.4 Minimum clearance to inter-span poles

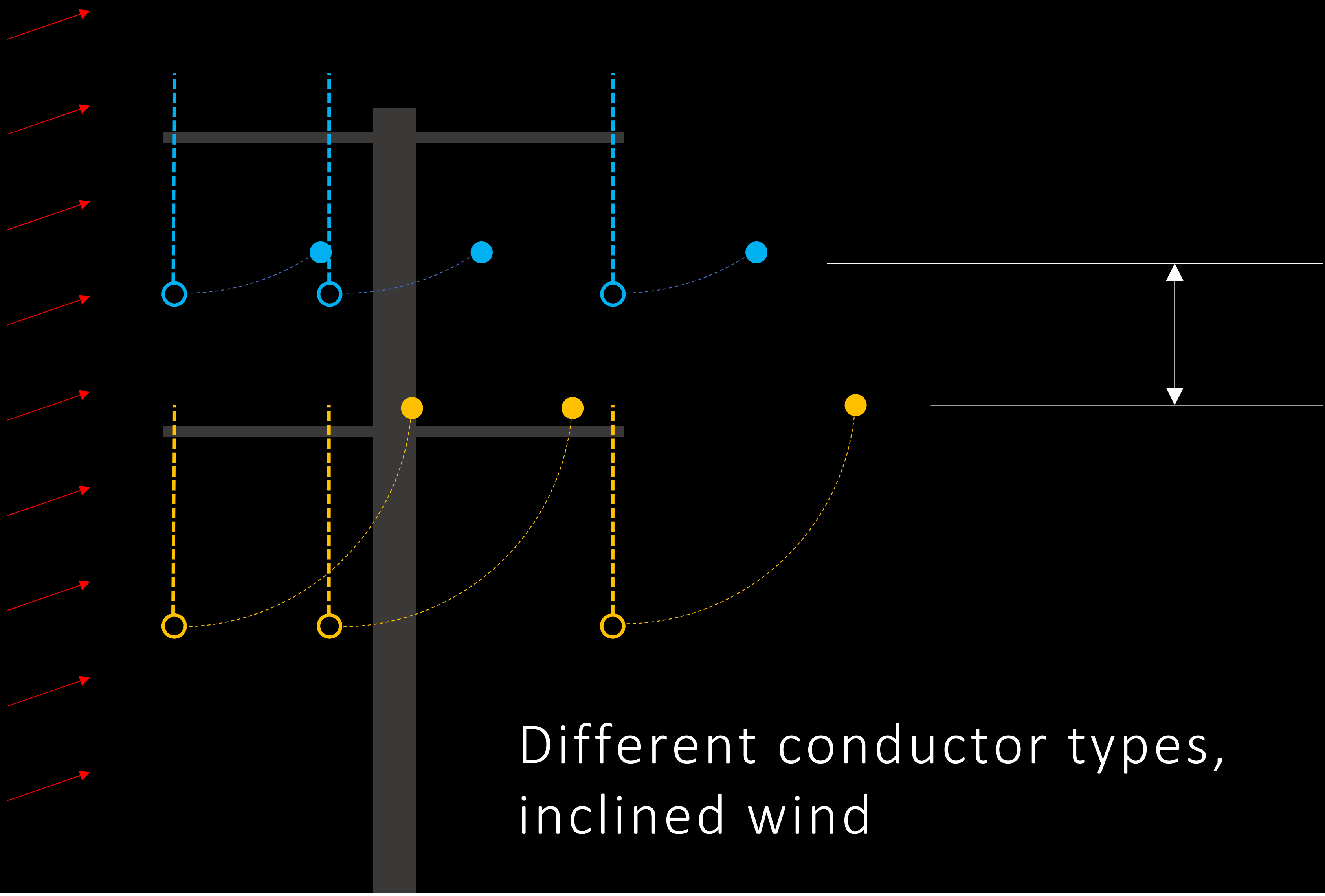
Poles may be installed in between spans to accommodate street lights or low voltage services and electrical clearance shall be provided for maintenance personnel. The minimum separation between the circuit at maximum operating temperature and inter-span pole for voltages up to 33 kV shall be 1.5 m (see Figure 3.8).



Same conductor type



Different conductor types



Different conductor types,
inclined wind

Circuit to circuit clearance review

Assume circuits are places above one another such that at any given time in their swung out position the upper and lower circuit conductors are in the same vertical plane at mid span. This is reasonable for 3 phase flat construction

Span length		142.2		
Circuit		Upper	Lower	
Nominal phase to phase voltage	(V_{na})	66	11	kV
Nominal phase to earth voltage	(V_a)	38.1	6.4	kV
Conductor type		NITROGEN	HELIUM	
Initial tension		9.5%	9.5%	%UTS
Initial temp		10	10	°C
Final temp		50	50	°C
Diameter	D	21.0	11.3	mm
Linear conductor force	w	7.06	2.07	N/m
Initial tension		5.91	1.67	kN
Final tension		4.55	1.30	kN
Initial sag	D	3.02	3.13	m
Final sag		3.92	4.02	m

Preceeding hill slope θ (°)	20
R	0.545
v	0.369

Phase angle difference between circuits (Ø)		180	°
Constant (q)		0.01	(3.7.3.3)
RMS vector potential difference (U)		44.5	kV (Eq 3.2)
Required circuit to circuit clearance at any point in span		0.71	m Eq 3.3
Required vertical circuit to circuit separation		1.51	m Eq 3.3
Required vertical circuit to circuit separation	0.4	0.92	m Eq 3.2
Required vertical circuit to circuit separation	0.6	1.25	m Eq 3.2
Required vertical circuit to circuit separation	0.8	1.58	m Eq 3.2
Required vertical circuit to circuit separation	1	1.92	m Eq 3.2
Required vertical circuit to circuit separation		2.40	m - Proposed method)

This calculation calculates the vertical lift of each conductor for a given wind pressure

Wind pressure	Pa	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
Vertical lift at midspan (lower conductor)		0	0.14	0.49	0.91	1.30	1.64	1.92	2.16	2.35	2.50	2.64	2.75	2.85	2.93	3.00	3.07	3.12	3.17	3.22	3.26	3.29
Vertical lift at midspan (upper conductor)		0	0.04	0.16	0.34	0.55	0.77	1.00	1.21	1.40	1.57	1.73	1.88	2.01	2.12	2.22	2.32	2.40	2.48	2.55	2.61	2.67

This calculation calculates the vertical lift of each conductor for a given wind pressure and wind vertical angle

Vertical wind angle (°) 20

Wind pressure	Pa	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
Vertical lift at midspan (upper conductor)		0	0.04	0.18	0.41	0.71	1.06	1.42	1.77	2.08	2.37	2.62	2.84	3.04	3.20	3.35	3.48	3.60	3.70	3.79	3.87	3.95
Vertical lift at midspan (lower conductor)		0	0.15	0.62	1.27	1.92	2.48	2.91	3.26	3.53	3.74	3.91	4.06	4.18	4.28	4.36	4.43	4.50	4.56	4.60	4.65	4.69
Vertical separation reduction at midspan (m)		0.00	-0.11	-0.44	-0.87	-1.21	-1.42	-1.49	-1.49	-1.44	-1.37	-1.29	-1.21	-1.14	-1.07	-1.01	-0.95	-0.90	-0.85	-0.81	-0.77	-0.74

Here it calculates the difference for a range of vertical wind angles

Vertical separation reduction at midspan (m)

		Wind pressure (Pa)																					Worst vertical separation reduction (m)
		0	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	
Vertical wind angle (°)	0	0	0.10	0.33	0.57	0.75	0.87	0.93	0.95	0.95	0.93	0.90	0.87	0.84	0.81	0.78	0.75	0.72	0.69	0.67	0.64	0.62	0.95
	5	0	0.10	0.36	0.64	0.85	0.99	1.05	1.07	1.06	1.03	1.00	0.96	0.92	0.88	0.84	0.81	0.77	0.74	0.71	0.69	0.66	1.07
	10	0	0.11	0.39	0.71	0.96	1.11	1.19	1.20	1.18	1.14	1.10	1.05	1.00	0.95	0.90	0.86	0.82	0.79	0.75	0.72	0.70	1.20
	15	0	0.11	0.42	0.79	1.08	1.26	1.33	1.34	1.31	1.26	1.20	1.13	1.07	1.01	0.96	0.91	0.87	0.83	0.79	0.75	0.72	1.34
	20	0	0.11	0.44	0.87	1.21	1.42	1.49	1.49	1.44	1.37	1.29	1.21	1.14	1.07	1.01	0.95	0.90	0.85	0.81	0.77	0.74	1.49
	25	0	0.11	0.46	0.95	1.36	1.59	1.67	1.65	1.58	1.49	1.39	1.29	1.20	1.12	1.05	0.98	0.92	0.87	0.83	0.79	0.75	1.67
	30	0	0.11	0.48	1.04	1.52	1.79	1.87	1.83	1.73	1.60	1.47	1.36	1.25	1.16	1.07	1.00	0.94	0.88	0.83	0.79	0.75	1.87

Upper conductor typ
Lower conductor typ
r/Lower Conductor Diameter/Mass Rat

The results are collected here as sag normalised separation reductions:

	2.67	1.48
0.40	0.79	-0.40
0.60	1.19	0.00
0.80	1.58	0.40

		Conductor Diameter/Mass Ratio								
Upper conductor type		OXYGE	OXYGE	IODINE	NITRO	OXYGE	LAMPR	OXYGE	HELIUN	OXYGEN
Lower conductor type		CHLOR	HELIUN	CHLOR	HELIUN	IODINE	HELIUN	NEON	FLOUR	OXYGEN
Upper/Lower Conductor Diameter/Mass Ratio		0.32	0.48	0.53	0.54	0.61	0.74	0.78	0.80	1
ove	0	0.41	0.28	0.24	0.23	0.19	0.11	0.09	0.08	0
	5	0.46	0.31	0.27	0.26	0.21	0.13	0.11	0.09	0

Circuit to circuit clearance review

Assume circuits are places above one another such that at any given time in their swung out position the upper and lower circuit conductors are in the same vertical plane at mid span. This is reasonable for 3 phase flat construction

Span length		142.2		
Circuit		Upper	Lower	
Nominal phase to phase voltage	(V_{na})	66	11	kV
Nominal phase to earth voltage	(V_a)	38.1	6.4	kV
Conductor type		NITROGEN	HELIUM	
Initial tension		9.5%	9.5%	%UTS
Initial temp		10	10	°C
Final temp		50	50	°C
Diameter	D	21.0	11.3	mm
Linear conductor force	w	7.06	2.07	N/m
Initial tension		5.91	1.67	kN
Final tension		4.55	1.30	kN
Initial sag	D	3.02	3.13	m
Final sag		3.92	4.02	m

Preceeding hill slope θ (°)	20
R	0.545
v	0.369

Phase angle difference between circuits (Ø) 180 °

Required circ

R

Required

Required

Required

Required

Required

This calculation calculates the vertical lift of each conductor for a given wind pressure

Wind pressure	Pa	0	50	100	150	200	250	300	350	400	450	500	550	600	650	70
Vertical lift at midspan (lower conductor)		0	0.14	0.49	0.91	1.30	1.64	1.92	2.16	2.35	2.50	2.64	2.75	2.85	2.93	3.0
Vertical lift at midspan (upper conductor)		0	0.04	0.16	0.34	0.55	0.77	1.00	1.21	1.40	1.57	1.73	1.88	2.01	2.12	2.2

This calculation calculates the vertical lift of each conductor for a given wind pressure and wind vertical angle

Vertical win

Wind pressure	Pa	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700
Vertical lift at midspan (upper conductor)		0	0.04	0.18	0.41	0.71	1.06	1.42	1.77	2.08	2.37	2.62	2.84	3.04	3.20	3.3
Vertical lift at midspan (lower conductor)		0	0.15	0.62	1.27	1.92	2.48	2.91	3.26	3.53	3.74	3.91	4.06	4.18	4.28	4.3
Vertical separation reduction at midspan (m)		0.00	-0.11	-0.44	-0.87	-1.21	-1.42	-1.49	-1.49	-1.44	-1.37	-1.29	-1.21	-1.14	-1.07	-1.0

Here it calculates the difference for a range of vertical wind angles

Vertical separation reduction at midspan (m)

		Wind pressure (Pa)																					
		0	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	reduction (m)
Vertical wind angle (°)	0	0	0.10	0.33	0.57	0.75	0.87	0.93	0.95	0.95	0.93	0.90	0.87	0.84	0.81	0.78	0.75	0.72	0.69	0.67	0.64	0.62	0.95
	5	0	0.10	0.36	0.64	0.85	0.99	1.05	1.07	1.06	1.03	1.00	0.96	0.92	0.88	0.84	0.81	0.77	0.74	0.71	0.69	0.66	1.07
	10	0	0.11	0.39	0.71	0.96	1.11	1.19	1.20	1.18	1.14	1.10	1.05	1.00	0.95	0.90	0.86	0.82	0.79	0.75	0.72	0.70	1.20
	15	0	0.11	0.42	0.79	1.08	1.26	1.33	1.34	1.31	1.26	1.20	1.13	1.07	1.01	0.96	0.91	0.87	0.83	0.79	0.75	0.72	1.34
	20	0	0.11	0.44	0.87	1.21	1.42	1.49	1.49	1.44	1.37	1.29	1.21	1.14	1.07	1.01	0.95	0.90	0.85	0.81	0.77	0.74	1.49
	25	0	0.11	0.46	0.95	1.36	1.59	1.67	1.65	1.58	1.49	1.39	1.29	1.20	1.12	1.05	0.98	0.92	0.87	0.83	0.79	0.75	1.67
	30	0	0.11	0.48	1.04	1.12	1.79	1.87	1.83	1.73	1.60	1.47	1.36	1.25	1.16	1.07	1.00	0.94	0.88	0.83	0.79	0.75	1.87

Wind press					
0	250	300	350	400	450
5	0.87	0.93	0.95	0.95	0.93
5	0.99	1.05	1.07	1.06	1.03
6	1.11	1.19	1.20	1.18	1.14
8	1.26	1.33	1.34	1.31	1.26
1	1.42	1.49	1.49	1.44	1.37
6	1.59	1.67	1.65	1.58	1.49
2	1.79	1.87	1.83	1.73	1.60

Upper conductor typ

Lower conductor typ

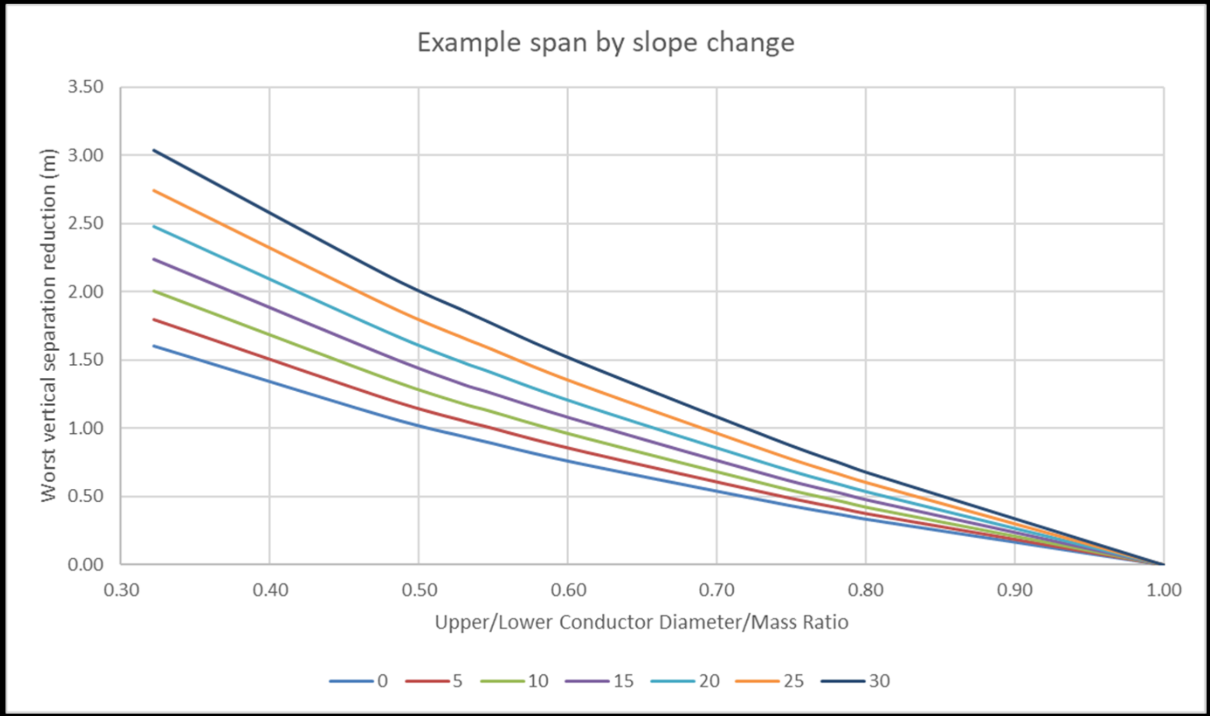
r/Lower Conductor Diameter/Mass Rat

The results are collected here as sag normalised separation reductions:

	2.67	1.48
0.40	0.79	-0.40
0.60	1.19	0.00
0.80	1.58	0.40

		Conductor Diameter/Mass Ratio								
Upper conductor type		OXYGE	OXYGE	IODINE	NITRO(	OXYGE	LAMPR	OXYGE	HELIUN	OXYGEN
Lower conductor type		CHLOR	HELIUN	CHLOR	HELIUN	IODINE	HELIUN	NEON	FLOUR	OXYGEN
Upper/Lower Conductor Diameter/Mass Ratio		0.32	0.48	0.53	0.54	0.61	0.74	0.78	0.80	1
ove	0	0.41	0.28	0.24	0.23	0.19	0.11	0.09	0.08	0
	5	0.46	0.31	0.27	0.26	0.21	0.13	0.11	0.09	0

Upper conductor type	Lower conductor type	Upper/Lower Conductor Diameter/Mass Ratio
OXYGEN	CHLORINE	0.32
OXYGEN	HELIUM	0.48
IODINE	CHLORINE	0.53
NITROGEN	HELIUM	0.54
OXYGEN	IODINE	0.61
LAMPREY	HELIUM	0.74
OXYGEN	NEON	0.78
HELIUM	FLOURINE	0.80
OXYGEN	OXYGEN	1



3.7.3 Conductors on the same supports (same or different circuits and shared spans)

3.7.3.1 *General*

This Clause provides the minimum requirements between conductors or cables attached to the same support, and sharing the same span to prevent circuit-to-circuit or phase-to-phase flashover under operating conditions.

Where conductors or cables are carried on the same pole or support as those of a higher voltage the lower voltage conductors shall be placed below the higher voltage conductors, or beside in the case of vertical circuit construction.

Any two bare conductors having a difference in voltage with respect to each other shall have vertical, horizontal or angular separation from each other in accordance with the values required by Clause 3.7.3.2 (See Figure 3.5), provided that the clearance at the support or at any part in the span is not less than the separation nominated in Item (b) (See Figure 3.6).

The separation given by Clause 3.7.3.2 is intended to cater for differential (out of phase and in phase) movement of conductors under wind conditions with minimum turbulence. The separation given by Clause 3.7.3.3 is a minimum under any circumstances.

3.7.3.2 *At mid span*

The mid span conductor separation for a single circuit can be determined using Equation 3.1and Figure 3.5.

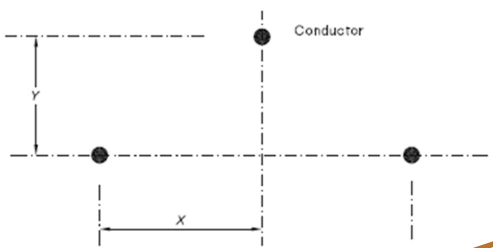


FIGURE 3.5 CONDUCTOR SEPARATION AT MID SPAN (ONE CIRCUIT)

$$\sqrt{X^2 + (1.2Y)^2} \geq \frac{U}{150} + k\sqrt{D + l_i} \quad \ldots 3.1$$

where

X = is the projected horizontal distance in metres between the conductors at mid span; ($X = (X_1 + X_2)/2$) where X_1 is the projected horizontal distance between the conductors at one support and X_2 is the projected horizontal distance between the conductors at the other support in the same span

Y = is the projected vertical distance in metres between the conductors at mid span; ($Y = (Y_1 + Y_2)/2$) where Y_1 is the projected vertical distance between the conductors at one support and Y_2 is the projected vertical distance between the conductors at the other support in the same span

$$v = (1 - R)^{1.31}(0.645 + 0.015 \times \theta + 0.00022 \times \theta^2)$$

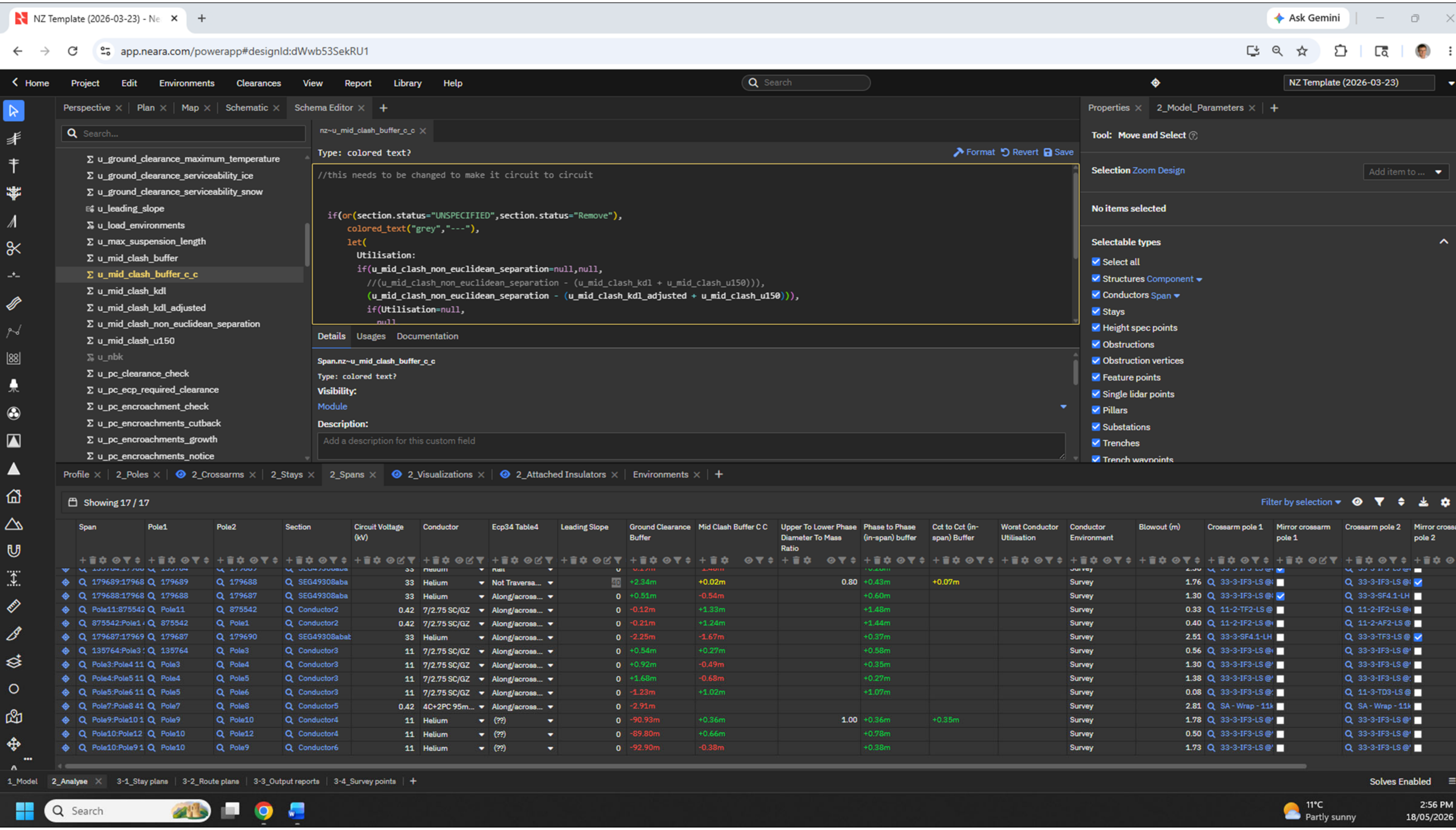
$$X^2 + (1.2Y)^2 \geq \frac{U}{150} + 0.4\sqrt{D + l_i} + v(D + l_i)$$

where:

$\theta = Approaching\ ground\ slope\ in\ degrees$

$R = Upper\ to\ lower\ phase\ diameter\ to\ mass\ ratio$

$$R = \frac{Diameter_{Upper\ conductor} Mass_{Lower\ conductor}}{Diameter_{Lower\ conductor} Mass_{Upper\ conductor}}$$



NZ Template (2026-03-23) - Ne
Ask Gemini
app.neara.com/powerapp#designId:dWwb53SekRU1
Home
Project
Edit
Environments
Clearances
View
Report
Library
Help
Search
NZ Template (2026-03-23)
Perspective
Plan
Map
Schematic
Schema Editor
u_ground_clearance_maximum_temperature
u_ground_clearance_serviceability_ice
u_ground_clearance_serviceability_snow
u_leading_slope
u_load_environments
u_max_suspension_length
u_mid_clash_buffer
u_mid_clash_buffer_c_c
u_mid_clash_kdl
u_mid_clash_kdl_adjusted
u_mid_clash_non_euclidean_separation
u_mid_clash_u150
u_nbk
u_pc_clearance_check
u_pc_ecp_required_clearance
u_pc_encroachment_check
u_pc_encroachments_cutback
u_pc_encroachments_growth
u_pc_encroachments_notice
nz~u_mid_clash_buffer_c_c
Type: colored text?
Format
Revert
Save
//this needs to be changed to make it circuit to circuit
if(or(section.status="UNSPECIFIED",section.status="Remove"),
colored_text("grey","---"),
let(
Utilisation:
if(u_mid_clash_non_euclidean_separation=null,null,
//(u_mid_clash_non_euclidean_separation - (u_mid_clash_kdl + u_mid_clash_u150))),
(u_mid_clash_non_euclidean_separation - (u_mid_clash_kdl_adjusted + u_mid_clash_u150))),
if(Utilisation=null,
Details
Usages
Documentation
Span.nz~u_mid_clash_buffer_c_c
Type: colored text?
Visibility:
Module
Description:
Add a description for this custom field
Properties
2_Model_Parameters
Tool: Move and Select
Selection Zoom Design
Add item to ...
No items selected
Selectable types
Select all
Structures Component
Conductors Span
Stays
Height spec points
Obstructions
Obstruction vertices
Feature points
Single lidar points
Pillars
Substations
Trenches
Trench waypoints
Profile
2_Poles
2_Crossarms
2_Stays
2_Spans
2_Visualizations
2_Attached Insulators
Environments
Showing 17 / 17
Filter by selection
Span | Pole1 | Pole2 | Section | Circuit Voltage (kV) | Conductor | Ecp34 Table4 | Leading Slope | Ground Clearance Buffer | Mid Clash Buffer C C | Upper To Lower Phase Diameter To Mass Ratio | Phase to Phase (in-span) buffer | Cct to Cct (in-span) Buffer | Worst Conductor Utilisation | Conductor Environment | Blowout (m) | Crossarm pole 1 | Mirror crossarm pole 1 | Crossarm pole 2 | Mirror crossarm pole 2
179689:17968 | 179689 | 179688 | SEG49308aba | 33 | Helium | Not Traversa... | 40 | +2.34m | +0.02m | 0.80 | +0.43m | +0.07m | | Survey | 1.76 | 33-3-IF3-LS @ | | 33-3-IF3-LS @ |
179688:17968 | 179688 | 179687 | SEG49308aba | 33 | Helium | Along/across... | 0 | +0.51m | -0.54m | | +0.60m | | | Survey | 1.30 | 33-3-IF3-LS @ | | 33-3-SF4.1-LH |
Pole11:875542 | Pole11 | 875542 | Conductor2 | 0.42 | 7/2.75 SC/GZ | Along/across... | 0 | -0.12m | +1.33m | | +1.48m | | | Survey | 0.33 | 11-2-TF2-LS @ | | 11-2-IF2-LS @ |
875542:Pole1 | 875542 | Pole1 | Conductor2 | 0.42 | 7/2.75 SC/GZ | Along/across... | 0 | -0.21m | +1.24m | | +1.44m | | | Survey | 0.40 | 11-2-IF2-LS @ | | 11-2-AF2-LS @ |
179687:17969 | 179687 | 179690 | SEG49308abat | 33 | Helium | Along/across... | 0 | -2.25m | -1.67m | | +0.37m | | | Survey | 2.51 | 33-3-SF4.1-LH | | 33-3-TF3-LS @ |
135764:Pole3 | 135764 | Pole3 | Conductor3 | 11 | 7/2.75 SC/GZ | Along/across... | 0 | +0.54m | +0.27m | | +0.58m | | | Survey | 0.56 | 33-3-IF3-LS @ | | 33-3-IF3-LS @ |
Pole3:Pole4 11 | Pole3 | Pole4 | Conductor3 | 11 | 7/2.75 SC/GZ | Along/across... | 0 | +0.92m | -0.49m | | +0.35m | | | Survey | 1.30 | 33-3-IF3-LS @ | | 33-3-IF3-LS @ |
Pole4:Pole5 11 | Pole4 | Pole5 | Conductor3 | 11 | 7/2.75 SC/GZ | Along/across... | 0 | +1.68m | -0.68m | | +0.27m | | | Survey | 1.38 | 33-3-IF3-LS @ | | 33-3-IF3-LS @ |
Pole5:Pole6 11 | Pole5 | Pole6 | Conductor3 | 11 | 7/2.75 SC/GZ | Along/across... | 0 | -1.23m | +1.02m | | +1.07m | | | Survey | 0.08 | 33-3-IF3-LS @ | | 11-3-TD3-LS @ |
Pole7:Pole8 41 | Pole7 | Pole8 | Conductor5 | 0.42 | 4C+2PC 95m... | Along/across... | 0 | -2.91m | | | | | | Survey | 2.81 | SA - Wrap - 11k | | SA - Wrap - 11k |
Pole9:Pole10 1 | Pole9 | Pole10 | Conductor4 | 11 | Helium | (??) | 0 | -90.93m | +0.36m | 1.00 | +0.36m | +0.35m | | Survey | 1.78 | 33-3-IF3-LS @ | | 33-3-IF3-LS @ |
Pole10:Pole12 | Pole10 | Pole12 | Conductor4 | 11 | Helium | (??) | 0 | -89.80m | +0.66m | | +0.78m | | | Survey | 0.50 | 33-3-IF3-LS @ | | 33-3-IF3-LS @ |
Pole10:Pole9 1 | Pole10 | Pole9 | Conductor6 | 11 | Helium | (??) | 0 | -92.90m | -0.38m | | +0.38m | | | Survey | 1.73 | 33-3-IF3-LS @ | | 33-3-IF3-LS @ |
1_Model
2_Analyse
3-1_Stay plans
3-2_Route plans
3-3_Output reports
3-4_Survey points
Solves Enabled
Search
11°C
Partly sunny
2:56 PM
18/05/2026

OLENZ

OVERHEAD LINE ENGINEERING

THANK YOU

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