Cable Type	Installation	AS/NZS 3008.1.1/2017
SDI with stranded copper conductors	Laid in Trefoil	Table 40
	Laid flat touching or in a wiring enclosure	41
Multicore with circular copper conductor	ALL	Table 42
SDI with Aluminium conductor	Laid in Trefoil	43
	Laid flat touching	44
Multicore with circular Aluminium conductors	ALL	Table 45
Singlecore flexi cord flexi cable	Laid in Trefoil	46
	Laid flat touching or in wiring enclosure	47
Multicore flexi cord & Flexi cable	ALL	Table 48
MIMS CABLE	ALL	Table 49
Copper aerial conductors	Aerial wiring System	Table 50
Aluminium aerial conductor	Aerial wiring System	Table 51

CONTINUE

Consumer main 2x 16mm² XLPE

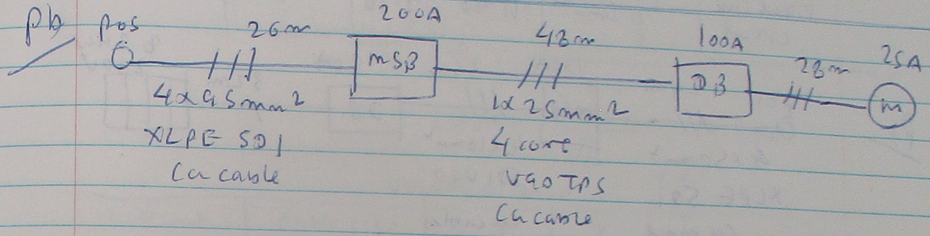
Two single cores Table 41 (No Trefoil) col 8

16mm² → 90°C 2.55   Vc = 2.55 x 1.155 = 2.94V

$V_d = \frac{V_c L I}{1000} = \frac{2.94 \times 18 \times 63}{1000} = 3.33V$

Voltage drop

Circuit	cable size	volt	%	Table	column
Consumer main	16mm²	3.33	$\frac{3.33}{240} \times 100 = 1.38$	41	8
Final sub ckt	2.5mm²	10.4	$\frac{10.4}{240} \times 100 = 4.33\%$	42	8



Final subcircuit. 3 cores V90 TPS Cu cable tied on a perforated cable tray adequate spaced from other ckt to avoid derating.

Consumer mains — tied to a dedicated cable tray in trefoil.

Perforated Tray, 3cores V90 SDI

Table 3(1) Item 10 derating 24, Table 13/14 col 2-4

—— 15 col 2 & 3

V90 ∴ Table 14 col 2

25A → 2.5mm²

Consumer main - Vc   3 cores, Table 42

95mm² → 0.450

$V_d = \frac{V_c L I}{1000} = \frac{0.45 \times 26 \times 200}{1000} =$ ~~0.3~~ 2.34V

Submain 25mm² → 1.61

$V_d = \frac{V_c L I}{1000} = \frac{1.61 \times 48 \times 100}{1000} = 7.728V$

Final sub (~~Consumer main~~) ~~95mm²~~ 2.5mm² → 16.4 mV/A-m

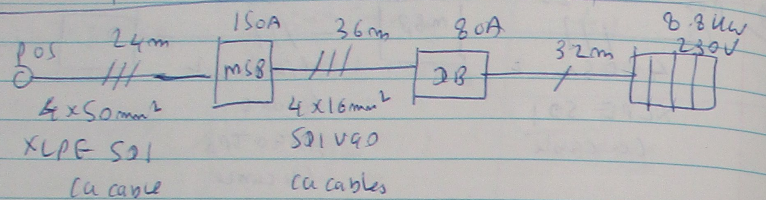
$V_d = \frac{V_c L I}{1000} = \frac{16.4 \times 28 \times 25}{1000} = 11.48V$

cut

Voltage Drop

Circuit	Cable size	Volt	%	Table	Column
Consumer main	$95mm^2$	2.34V	5.6	42	8
Submain	$25mm^2$	7.728V	1.86	42	8
Final sub circuit	$2.5mm^2$	11.48	2.76	42	8

Pb



The final subcircuit pictured above is to be a two core V90 TPS cu cable, installed on a single tier horizontal perforated ~~tray~~ cable tray, laid flat and touching cables of other circuit, main cables are laid flat on cable tray. Select cable for final subcircuit.

Final subcct

$Load = \frac{8.8kW}{230V} = \frac{8.8 \times 10^3}{230} = 38.26A$

~~Single~~ cable / two core — Table 3(4) — Single tier horizontal perforated tray
Item 9 — Derating Table 24
Table 10/11 col 2→4, Table 12 col 2 & 3

Laid flat, touching, another cct → 2 circuits

Perforated tray — 1 row Item 7 - 2 cct → factor 0.88

$I = \frac{38.26}{0.88} = 43.4A$

V90. Table 11 - col 2 — 43.4A → 45A → $4mm^2$

~~Sing~~ two core — Touching V90 — $4mm^2$ → 10.2 mV/A-m

Table 42 col 8 — $Vd = \frac{VcLI}{1000} = \frac{(\times 1.155)\, 10.2 \times 32 \times 45}{1000} = 16.96V$ 1ϕ

$6mm^2$ - 6.8 → $\frac{1.155 \times 6.8 \times 32 \times 45}{1000} = 11.3 = 4.7\%$

$10mm^2$ 4.05 - $1.155 \times 4.05 \times 32 \times 45/1000 = 6.7$

Consumer main

$50mm^2$ → 0.868 — $Vd = \frac{VcLI}{1000} = \frac{0.868 \times 24 \times 150}{1000}$
$= 3.124V$

$1\phi\ Vd = \frac{3.124}{\sqrt{3}} = 1.8V$

Submain — $16mm^2$ → 2.55 mV/A-m

$Vd = \frac{VcLI}{1000} = \frac{2.55 \times 36 \times 80}{1000} = 7.344V$

$1\phi\ Vd = \frac{7.344}{\sqrt{3}} = 4.230$

Voltage Drop 1ϕ

Circuit	Cable size	Volt	%	Table	Column
Consumer main	$50mm^2$	3.124/1.8	(0.75)	42	8
Submain	$16mm^2$	7.344/4.23	(1.76)	42	8
Final sub cct	$4mm^2$	16.96	7.06%	42	8
	$6mm^2$	11.3	4.7%		
	$10mm^2$	6.7	(2.8%)	Total	5.31%

$16mm^2$ 2

Maximum voltage drop permissible
3.6.2 ~~5%~~ not to exceed 5% of supply

$16mm^2$ ⇒ 2.55 $Vd = \frac{1.155 \times 2.55 \times 32 \times 45}{1000} = 4.24V = 1.76\%$

∴ Total = 0.75 + 1.76 + 1.76 = 4.27%

Factors affecting voltage drop

$Vd = \frac{VcLI}{1000}$ = – cable configuration — AS3008
– Length
– current

What effect will increase load current have on voltage dropped in the circuit.
mutual induction ~~in~~ in conductive cct group will impact voltage drop increase.

What effect will increase in the operating temperature of copper circuit conductors have on voltage dropped in the circuit?

3.2.2 AS3008

Cable operating at the maximum conductor temperature permitted by the cable insulating materials when installed in specified ambient condition.

7.2 Select cables based on earth fault loop impedance limitations

Reactance table	Ω/km
All cables except flexible cords, flexible cables, MIMS cable aerial cable	Table 30
Flexible cords, flexible cables	Table 31
MIMS cable	Table 32
Aerial cable	Table 33

AC resistance table

Single core cable	Table 34
multicore cable with circular conductors	Table 35
multicore cable with shaped conductor	Table 36
Flexible cords / flexible cable	Table 37
MIMS cable	Table 38
Aerial cable	Table 39

Conductor impedance

$\Omega \quad X = \frac{X_c \times L}{1000}$ $\quad R_c = \Omega/km$

$\Omega \quad R = \frac{R_c \times L}{1000}$

$Z = \sqrt{R^2 + X^2}$ | $X_{ph} = \frac{X_c \times L}{1000}$

35m

R_c 2.33 Ω/km 10mm² active conductor

5.88 Ω/km 4mm² protective earthing conductor

single core Table 34, 90°C, 4mm

$R_{ph} = \frac{R_c \times L}{1000} = \frac{2.33 \times 35}{1000} = 81.6\,m\Omega$

$R_e = \frac{5.88 \times 35}{1000} = 206\,m\Omega$

X_c 0.129 Ω/km for 10mm² active conductor

0.152 Ω/km for 4mm² protective earthing conductor

$X_{ph} = \frac{X_c \times L}{1000} = \frac{0.129 \times 35}{1000} = 4.52\,m\Omega$

$X_e = \frac{0.152 \times 35}{1000} = 5.32\,m\Omega$

$Z_{ph} = \sqrt{X_{ph}^2 + R_{ph}^2} = \sqrt{(4.52 \times 10^{-3})^2 + (81.6 \times 10^{-3})^2}$

$Z_{ph} = 0.08\,\Omega$

$Z_e = \sqrt{X_e^2 + R_e^2} = \sqrt{(5.32 \times 10^{-3})^2 + (206 \times 10^{-3})^2}$

$= 0.2\,\Omega$

$Z_{phe} = 0.08 + 0.2 = 0.28\,\Omega$

Maximum circuit resistance

Table 35, 4mm², 75°C, col 4

4mm² Two core & earth TPS cable

2.5mm² protective earthing conductor.

Protection 32A Type C circuit breaker

Length = 30m

4mm² active: $R_c = 5.61\,\Omega/km = \frac{5.61 \times 30}{1000} = 0.168\,\Omega$

2.5mm² earth = $R_c = 9.01\,\Omega/km \rightarrow R_e = \frac{9.01 \times 30}{1000}$

$= 0.27\,\Omega$

Table 35, 75°C

$R_{phe} = R_{ph} + R_e = 0.168 + 0.27 = 0.438\,\Omega$

Impedance calculation

(1) 2.5mm² two cores & earth V90 flat TPS
37m
20A CB

Table 30 col 9
$X_C = 0.102$

Table 35 2.5mm² — 9.01 Ω/km
75°C
col 4

$R_C = \frac{9.01 \times 37}{1000} = 0.33\Omega$

$\frac{0.102 \times 37}{1000} = 0.00377$

(2) 6mm² two cores & earth V90 TPS Cu cable
52m 40 A Type (C) CB
Table 35 col 4
6mm² → 3.75 Ω/km

$R_C = \frac{3.75 \times 52}{1000} = 0.195\Omega$

Table 30 col 9
$X_C = 0.0967$
$\frac{0.0967 \times 52}{1000} = 0.005$

(3) 16mm² singlecore XLPE Cu cable laid flat touching
28m 80A Type (C) CB
Table 34 col 4
16mm² → 1.4 Ω/km

$R_C = \frac{1.4 \times 28}{1000} = 0.0392\Omega$

Table 30 col 10
$X_C = 0.0805 \rightarrow \frac{0.0805 \times 28}{1000} = 0.00254$

(4) 4mm² two cores & earth V90 Flat TPS Cu cable
45m 25A Type D CB
Table 35 col 4
4mm² — 5.61 Ω/km

$R_C = \frac{5.61 \times 45}{1000} = 0.252\Omega$

Table 30 col 9
X_C 0.102
$\frac{0.102 \times 45}{1000} = 0.00459$

AS3008
(8) Table 8.1 — maximum allowable value of Earth fault loop impedance
Table B1 — maximum allowable circuit route length.

Cable size		Circuit breaker		Maximum Earth fault Loop impedance	Maximum Circuit Route Length
Active	Earth	Nominal current	Type	Table B1	Table B1
1.5mm²	1.5mm²	10A	B	5.8Ω	82m
2.5mm²	2.5mm²	20A	C	1.5Ω	68m
4mm²	2.5mm²	25A	D	0.7Ω	67m
4mm²	2.5mm²	32A	C	1Ω	52m
6mm²	2.5mm²	40A	C	0.8Ω	48m
10mm²	4mm²	50A	B	1.2Ω	62m
16mm²	6mm²	63A	C	0.5Ω	76m
25mm²	6mm²	80A	D	0.2Ω	66m
35mm²	6mm²	100A	D	0.2Ω	53m
70mm²	25mm²	200A	C	0.2Ω	100m

$L_{max} = \frac{0.8\, U_0\, S_{ph}\, S_{pe}}{I_a\, \rho\, (S_{ph} + S_{pe})}$

pb 230V, 1φ, 2.5mm² active 2.5mm² protective earthing conductor 10A CB protection

$\rho = 22.5 \times 10^{-3}$ Cu
36×10^{-3} Al
I_a = Trip current setting not nominal current.

S_{ph} = CSA active mm²
S_{pe} = CSA earth mm²
U_0 = Nominal phase voltage L_{max} = max. route length.

$L_{max} = \frac{0.8 \times 230 \times 2.5 \times 2.5}{10 \times 22.5 \times 10^{-3} \times (2.5 + 2.5)}$ U_0 = ph voltage

$= \frac{0.8 \times 230 \times 2.5 \times 2.5 \times 10^3}{12.5 \times 10 \times 22.5 \times 5} = \frac{1022\text{m}}{12.5} = 81\text{m}$

Type D CB

Table B1 2.5mm² (Active) 2.5mm² earth, 10A CB → 26m (2.5% vd) 31m (3% vd) 42m (4%)

pb 6mm² maximum length of 400V 3φ ckt 25mm² Active, 16mm² protective earthing conductor 63A CB.

25 mm² (Active) (16mm² Earth) 63A
Type D CB

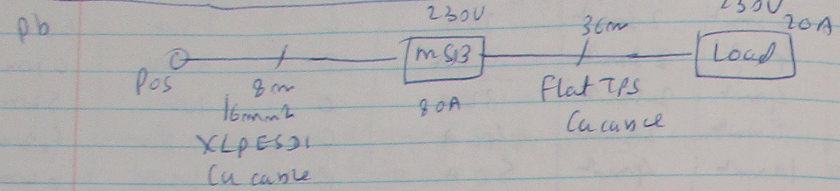
$L_{max} = \frac{0.8 \times 400/\sqrt{3} \times 25 \times 16}{12.5 \times 63 \times 22.5 \times 10^{-3} (25 + 16)} = 101\text{m}$

Table B1

Active 25mm² Earth 16mm² CB 63A 3φ 4% vd 98m

25mm² 6mm² CB 80A

pb



Two cores and earth Flat V90 TPS cu cable.
partially surrounded by thermal insulation.
Protected by 20A Type C circuit breaker,
230V consumer main, installed in HD PVC
corrugated conduit.
Select the cable for final subcircuit, based on current
carrying capacity requirement. Ensure coordination of
protection devices. AS/NZS 3008 Tables

230V, 20A Two cores + Earth Flat V90 TPS.
partially surrounded by insulation.

AS3008 Table 3(2) Item 9 → Table 10/11 col 15 → 18

Table 12 col 11

Derating Table 22

V90 → Table 11 col 15 — 2.5mm² (25A)

$I_B \leq I_N \leq I_Z$

max:
demand 20A ≤ I_N ≤ I_Z
given
Protective device
continuous current carrying capacity of cable

Table C6/C7 25A
AS3000
2.5mm²
→ CB = 20A
(or) 25A

\ Table 3(2) / 11
AS3008
2.5mm²

33A → 4mm²

Voltage drop

Consumer main HD PVC conduit

Final subcircuit Partially surrounded by thermal insulation

Two cores & Earth — multicore Table 42 V90 - 90°C col 8

16mm² → 3φ 2.55 mV/A-m 1φ 2.55×1.155 = 4.08 mV/A-m

4mm² → 10.2 mV/A-m 10.2×1.155 = 11.78 mV/A-m

$vd = \frac{V_c L I}{1000} = \frac{4.08 \times 8 \times 80}{1000} = 2.6112\,V$

$vd = \frac{V_c L I}{1000} = \frac{11.78 \times 36 \times 20}{1000} = 8.48\,V$

Total = 2.6112 + 8.48 = 11V

$\% = \frac{11}{240} \times 100 = 4.62\%$

Voltage Drop — AS/NZS 3008.1/2017

circuit	cable size	volt	%	Table	column
consumer main	16mm²	2.6112	1.08	42	8
Final subcircuit	4mm²	8.48	3.53	42	8

Final Sub circuit conductor Resistance Rc:
multicore — (2 core & earth) Table 35 AS3008
90°C 90°C

4mm² → 5.88Ω Table 35 col 5

$R_{ph} = \frac{R_c \times L}{1000} = \frac{5.88 \times 36m}{1000} = 0.21168\,\Omega$

Protective earthing conductor Table 5 of AS3000

4mm² → 2.5mm² — Earth wire

Table 35 col 5
Rpe = 2.5mm² - 9.45
Rpe

AS/NZS 3008.1:2017		AS NZS 3000 2018		Final subcircuit Rphe
Rc Table	column	Table	col	
35	5	5.1 C	3 9	0.551Ω

$R_{pe} = \frac{Rc \times L}{1000} = \frac{9.45 \times 36}{1000} = 0.34Ω$

$R_{phe} = R_{ph} + R_{pe} = 0.21168 + 0.34 = 0.551Ω$

Earth fault loop compliance — Table ~~8~~ 8.1

Length compliance Table B1

Table 8.1 protective device rating 80A

Protective device rating	Type B fel	Type C fel	Type D fel
80	0.7Ω	0.4Ω	0.2~~8~~1 Ω

Now we got 0.551Ω so ~~#~~ Type B circuit breaker can be used.

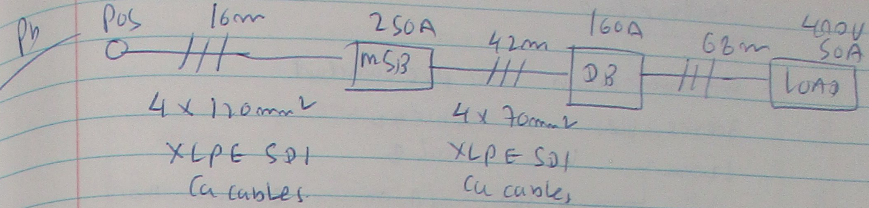
Table B1 1ϕ Rate Length.

Active	Earth	2.85% vd	3% vd	4% vd	MCB
4mm²	2.5mm²	31	34	50	67m

Now ckt length is 36m, agreed with, compliance (Yes)

Minimum final subckt conductor size to satisfy current carrying capacity voltage drop, earth fault loop impedance. (4mm²)

3ϕ circuit



The final subcircuit pictured above is to be wired using three core PVC insulated V90 Cu cables installed on a perforated tray with minimum spacing and protected by 50A Type C circuit breaker.

The installation's 400V consumer mains are installed in HV PVC underground conduit and the submains are installed in trefoil on a cable ladder with a 25mm² PVC insulated earthing conductor.

Select a cable for the final subcircuit based on current carrying capacity requirement ensuring coordination with the circuit protective device and record your answers and the applicable AS/NZS 3008.1.2017 Tables below.

Final sub circuit 3 cores PVC V90 Cu cables installed on perforated tray minimum spacing

Table 3(1) Item 10 → Table 13/14 col 2–4

Table 15 col 2/3

Derating Table 24

50A

V90 Table 14 col 2

50A → 66A → 10mm²

$I_B \leq I_N \leq I_Z$

Demand 50A ✓ | Protective device | cable size 10mm² → 66A ✓

Table C6 AS 3000

Table C7 AS3000

10mm² → 50A ✓

(16mm² 83A)

Cert 16mm² — 63A

Cable size 16mm²

AS3008 Table 14 col 2

3(1) Item 10

voltage drop

consumer main HV pvc conduit

3 cores cables Table 42

120mm² V90 col 8

└ 0.366 mV/A-m consumer main

$$V_d = \frac{V_c L I}{1000} = \frac{0.366 \times 16 \times 250}{1000} = 1.464\ V$$

Submain — trefoil, cable ladder multicore

Table 42 col 8

70mm² ⟶ 0.609 mV/A-m

$$V_d = \frac{V_c L I}{1000} = \frac{0.609 \times 42 \times 160}{1000} = 4.09\ V$$

Final sub cct

Perforated tray

10mm² — 4.05

$$V_d = \frac{V_c L I}{1000} = \frac{4.05 \times 68 \times 50}{1000} = 13.77\ V$$

16mm² — 2.55

$$V_d = \frac{V_c L I}{1000} = \frac{2.55 \times 68 \times 50}{1000} = 8.67$$

Vd total = 1.464 + 4.09 + 8.67 = 14.22

5% of 415V = $\frac{5}{100} \times 415$ = 20.75

Less than 5%, acceptable

Final subcircuit size 16mm²

$I_B \leq I_N \leq I_Z$

50A 63A 66A — cable current carrying capacity

maximum demand current (50A)

Protective switch gear size (63A)

voltage drop

circuit	cable size	volt	%	AS/NZS 3008.1.1 2017 Table	column
consumer main	120mm²	1.464	0.352%	42	8
Submain	70mm²	4.09	0.428%	42	8
Final sub circuit	~~66A~~ 16mm²	8.67	2.08	42	8
		14.22	3.42%		

Final subcircuit Active = 16mm²

multicore Table 35, 90C — col 5 AS3008

16mm² — 1.47 Ω/km (Rc)

$$R_{ph} = \frac{R_c L}{1000} = \frac{1.47 \times 68}{1000} = 0.09996\ \Omega$$

protective earthing conductor Table 5.1 AS3000

Active ⟶ Earth

copper 16mm² ⟶ 6mm²

Table 35 col 5

6mm² — 3.93 Ω/km

$$R_{pe} = \frac{R_c L}{1000} = \frac{3.93 \times 68}{1000} = 0.267\ \Omega$$

$$R_{phe} = R_{ph} + R_{pe} = 0.267 + 0.09996 = 0.36732\ \Omega$$

~~Rc table | column | AS/NZS 3008~~

Rc table	column	AS/NZS 3000 Table	Col	Final subcircuit
35	5	5.1 C	3 9	0.3672

Table 8.1 Protective device rating 63A

Protective device 63A	Type B	Type C CB	Type D
	0.9Ω	0.5Ω	0.3Ω

Type C CB can be used.

Table B1 route Length. 34

Active	Earth	2.5% vd	3% vd	4% vd	MCB
16mm²	6mm²	49m	59m	79	83

68m

Now compliance.

Does final subcircuit comply with AS/NZS 3000:2018 requirement for earth fault loop impedance

Yes

minimum final subcircuit conductor size to satisfy current carrying capacity, voltage drop, earth fault loop impedance 16mm²

---

(1) main factors affecting earth fault loop impedance of a circuit
- size of active wire & earth wire
- circuit breaker setting B5.2.2 8.3.9

(2) Why is it important for earth fault loop impedance to be maintained below the limit specified in AS 3000-2018?

8.3.9.2

(a) The earth fault loop impedance measured in accordance with clause 8.3.9.2.2 does not exceed the value shown in Table 8.1 for the applicable type and rating of the protective device (or)

(b) Total resistance (Rphe) of the active and protective earthing conductors measured in accordance with the clause 8.3.9.2.3 does not exceed the value shown in table 8.2

5.1.2 So that it can enable automatic disconnection of supply in the event of a short circuit to earth fault or excessive earth leakage current in protected part of installation

Tables 2

AS3000 t. maximum sec

k = constant

8.2 Select over current protection

$I_B \leq I_N \leq I_Z$

$t = \frac{k^2 S^2}{I^2}$

S = conductor CSA

I = Isc

I_B = maximum demand of the circuit

I_N = The nominal current of protecting device

I_Z = The current carrying capacity of the circuit wiring.

Table C7 + B1

Conductor		Circuit		Circuit breaker			
I_Z	Zs	Load I_B	Ief	I_N CB	Type	k A / Ia	Ia k a
27A	1Ω	8×10A 230V double socket outlet	10	20	D (0.9Ω) Zs	12.5 ×20 250	[illegible] 230/1 = 230A
38A	0.9Ω	6.8kW, 230V storage hotwater heater 29.5A	29.5	32A	C (1Ω Zs)	32× 7.5 240	230/0.9 255.5 [illegible]
28A	0.7Ω	3.7kW, 230V 1φ motor (0.74PF)	21.7	25A	D (0.7Ω) Zs	25×12.5 312.5	230/0.7 = 329
101A	0.1Ω	Distribution board with maximum demand of 85A	95	100A	D (0.2Ω Zs)	100× 12.5 1250	230/0.1 = 2300A
16A	0.9Ω	2.2kW 230V single phase motor (0.8Pf)	11.95	16A	D (1.2Ω)	16× 12.5 200	230/0.9 = 255.5
50A	0.3Ω	11kW stove	47.8	50	D 0.4Ω	50×12.5 625	230/0.9 = 255.5
25A	0.6Ω	7×500W halogen flood Lights	14.5	16A	D (1.2Ω)	16× 12.5 200	230/0.6 383.3
178A	0.1Ω	Distribution board with a maximum demand of 150A	150A	125A	D (0.1Ω)	125 ×125 1562	230/0.1 = 2300

Table B1 AS3000

P433

Table 8.1 AS3000

current causing automatic operation

Type B 4×
C 7.5
D 12.5

Page 455

$I_a = \frac{40}{Zs}$ ← (Automatic operation)

op = 6 kw

$I_P = \sqrt{3}\, E I \cos\phi$

$= 1.732 \times 400 \times 11 \times 0.9 = 6859$

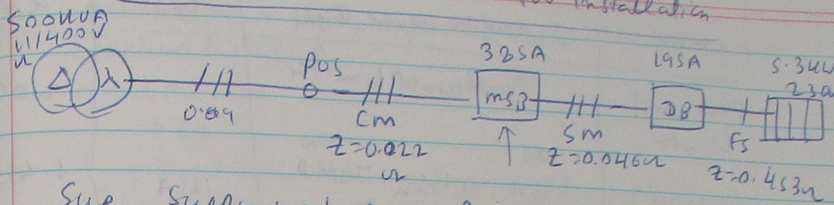
$\therefore$ effy $= \frac{O/P}{I/P} \times 100 = \frac{6000}{6859} \times 100$

$= 87.4\%$

$\boxed{I_B \leq I_N \leq 0.9 I_Z}$

Conductor I_Z	Conductor Z_S	Circuit Load	I_{EF}	IARC Fuse I_N	IARC Fuse Class
23A	0.7Ω	3.6kw 230V DOL 1ϕ motor 0.85pf	I_B 18.4; $\frac{230}{0.7} = 328.5$	$\frac{18.4}{0.9}$ 20.44	0.7Ω 50A 0.4sec
63A	0.3Ω	soft start 3ϕ motor with rated I_L of 47A	47; $\frac{230}{0.3} = 766A$	$\frac{47}{0.9} = 52.2$	0.3Ω 100A 0.4sec
16A	1.1Ω	5kw 400V apparatus with electronic control	$\frac{5000}{400}$ 12.5; $\frac{230}{1.1} = 209$	$\frac{12.5}{0.9} = 13.88$	1.1Ω 40A 0.4sec
120A	0.1Ω	Switchboard with max demand 85A	85; $\frac{230}{0.1} = 2300$	$\frac{85}{0.9}$ 94.4	0.1Ω 200A 0.4sec
216A	0.2Ω	Switchboard with max demand 160A	160; $\frac{230}{0.2} = 1150$	$\frac{160}{0.9} = 177$	0.2Ω 160A 0.4sec

Select over current protection for installation



Sup — Supply up to pos = Z = 0.09Ω

Cm — consumer's main Z = 0.022Ω

Sm — Submain Z = 0.046Ω

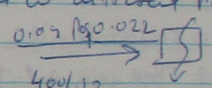
FSC — Final subcircuit Z = 0.453Ω

MSB = main switchboard maximum demand 385A/Ph

DB = Distribution board maximum demand 195A/Ph

Determine prospective fault current at different point

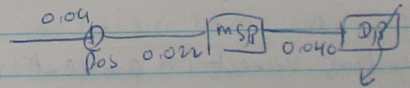
Main switchboard



$I_f = \frac{E_{Ph} = 400/\sqrt{3}}{0.022 + 0.09} = \frac{230}{0.112} = 2053\text{ A}$

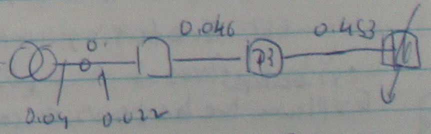
Distribution Board

$I_f = \frac{400/\sqrt{3}}{0.09 + 0.022 + 0.046} = \frac{230}{0.158} = 1455.6\text{ A}$



$I_f =$

Appliance Terminal



$I_f = \frac{400/\sqrt{3}}{0.09 + 0.022 + 0.046 + 0.453} = \frac{230}{0.611} = 376\text{ A}$

Circuit	Protective device Type	IN	KA
Fault current Limiter	Fault current Limiter		2.063kA
Submain	I_B 195A 0.150Ω, IN Type D	125A 160A	1.455kA
Final Sub Cct	I_B 23.04 0.611 Ω	Type D 32A	376A 0.376 kA

Consumer main = 325A
Submain 195A
Final subcct = $\frac{5.3 \times 10^3}{230} = 23.04$

31
f
8.1

① Five factors to be considered ~~for~~ when selecting overcurrent protection devices. ~~2.3~~ 2.5.3.1

(1) The current for which the circuit is designed (maximum demand)

(2) The nominal current of the protective device.

(3) The continuous current carrying capacity of conductor

(4) The current ensuring effective operation of protective device and may be taken as equal to either

(a) The operating current in conventional time for circuit breaker (1.45 IN) or

(b) The fusing current in conventional time for fuses.

(5) ~~Earth~~ (5) Earth fault loop impedance.

② Explain the hazards associated with incorrect selection of overcurrent protection device.

The circuit breaker will not be tripped off when fault occur ~~or~~ if the size is too big or will be burnt out at normal operation if the overcurrent device is small.

③ Acceptable methods of providing protection against indirect contact.

- EARTHING
- RCD
- Insulation

④ Describe where additional protection by a 30mA RCD is required in residential electrical installations

1.5.6, 2.6.3.1

1.5.6.3

RCDs shall be installed for additional protection of the following.

(a) circuits, socket-outlets, lighting points and hand held equipment as specified in part 2 ~~clause~~ clause 2.6

(b) Wiring systems as specified in part 2 clause 3.9.4.4

(c) Electric heating cables, as specified in part 2 clause 4.10.5

(d) Electrical equipment including socket outlets installed in damp situations as specified in part 2 section 6 of AS3000

(e) specific electrical installations as specified in AS/NZS 3001, AS/NZS 3002, AS/NZS 3003 AS/NZS 3004 AS/NZS 3012 and AS/NZS 4249.

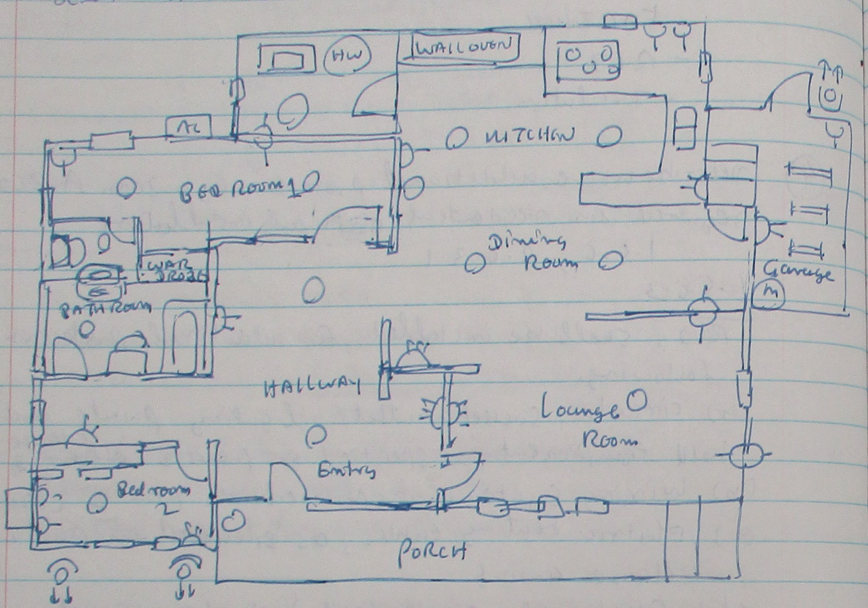
⑤ What is maximum short circuit disconnection time for a circuit supply 10A socket outlet?

8.4.3

5 seconds | Table 8.1 page 427/433

9.2 Select control devices

select control devices for domestic installation



1ϕ 230V 50HZ domestic electrical installation pictured above consists of circuits detailed in the following schedule.

circuit	LOAD	notes
1	Lighting circuit 1	
2	Lighting circuit 2	includes 3 x 150
3	10A Socket outlet 1	
4	10A Socket outlet 2	Include socket outlet installed outside
5	15A socket outlet	
6	oven	3.2kW wall oven
7	cooktop	6.2kW cooktop
8	Ducted A/C	8kW external unit installed outside bedroom 1
9	Hotwater heater	6kW offpeak installed in laundry
10	Garage door	450W 1ϕ roller door motor in garage.

Isolation & switching device, device type, location, rating (voltage current IP rating)

Circuit 1 Lighting

Isolation device location – (Diningroom, kitchen, lounge, Entry) main switch board CB

Device specification – ~~Gang Switch~~ 240V DETA 16A + RCD
240V CB + 20A DETA RCD

Switching device – ~~Gage~~ Gang Switch CRT 1
Diningroom kitchen, lounge
Entry

Device specification – HPM EXCEL 1 Gang wall Switch, 240V 10A

Circuit 2 Lighting

Isolation Device location – main switch board
Device specification – DETA 16A 240V CB + RCD
DETA 20A RCD
Switching devices – Bedroom 1 / 2 / Bathroom
Device specification – HPM EXCEL 1 Gang wall Switch 240V 10A

Circuit 3 socket outlet + cut 4

Isolation device location – main switch Board
Device specification – DETA 240V CB + DETA 20A RCD.
{kitchen, dining, Bedrooms
~~Soo~~ Switching Device – DETA Double power point socket outlet
+ device specifications. 240V (10A)

Circuit 5 socket outlet

Isolation device location – main switch board
DETA 240V CB + DETA 20A RCD
Device specification – DETA 240V CB + DETA 20A RCD

Switching Device – Socket outlet { Kitchen, Bedrooms, Dining room }
Device Specification – DETA single power point socket outlet 15A, 240V

Circuit 6 wall oven

Isolation Device Location – main switchboard
Specification – 32A circuit breaker / DETA miniature rating 10KA
Switching ~~Device~~ Location Kitchen –
Specification – oven switch 1 Gang 32Amp single with mech oven Isolator rated 32A

Circuit 7 cooktop

Isolation Device Location – main switch board
Specification – 32A circuit breaker, DETA miniature rating ~~4~~ 10KA
Switching Device Location – Kitchen.
Specification – DETA 45A double pole appliance switch 250V

Circuit 8 Airconditioning

Isolation Device Location – main switchboard
Specification – 32A circuit breaker, DETA miniature rating 10KA
Switching device Location – ~~x~~ Bedroom 1
Specification – 2i Borg Aircon Isolater weather proof switch 1 pole IP66

Circuit 9 water Heater

Isolation device Location – main switchboard.
Specification – 32A circuit breaker DETA miniature rating 10KA

Switching device Location – Laundry, ~~water heater room~~ ~~main switchboard~~
Specification – SWIFT hot water / electric water system switch

Circuit 10 Garage door

Isolation Device, Location – main switch board
Specification – 32A circuit breaker DETA miniature rating 10KA
Switching device – Garage – Garage door remote control
Specification
~~Mer~~ Merlin four buttons wall mount remote control Garage door ~~opener~~ opener. E145M wireless wall mount ~~x~~ remote control

Entire Installation control

Isolation Device and location
~~&~~ 63A Circuit Breaker – main switch board

Specification 2 poles circuit breaker (DL) C63 63Amp 415V, DL7-63/2/C

① What are the requirements for ~~the~~ identification of isolation devices?

2.3.3.5

(a) Each main switch shall be marked "MAIN SWITCH" and shall be readily distinguishable from other switchgear by means of grouping contrasting colouring or other suitable means to provide ~~for~~ for prompt operation in an emergency

(b) Where there is more than one main switch each main switch shall be marked to indicate the electrical installation or portion of the electrical installation ~~or~~ it controls.

(2) Describe the requirements for orientation of circuit protection devices.

2.10.3.4.1

Where two (or) more circuit breakers are mounted in the same row, the operating mechanism of each shall cause the circuit to open when the operating means are oriented in one general direction.

(3) IP66 Enclosure

Weather proof outdoor enclosures.

Dust tight protection for maximum performance against flying dust, dirt, debris and other particulates.

A high degree of protection against water ingress including all types of precipitation as well as hose-directed washdowns.

(4) Suitable IP rating for electrical control switch that requires protection against harmful deposits of dust?

PS22 Appendix (G) degree of protection

IP6 6 — G1a First Numeral; G1b Second Numeral

Dust (6); Jet water protection (6)

IP6X

(5) Suitable for electrical control switch to protect against strong jet of water

PS22 Appendix G

IP66 — Dust; Strong jet of water

IPX6

(6) Requirement for isolation in electrical installation

2.3.2.2.1

A device for isolation

(a) Shall be capable of withstanding an impulse voltage likely to occur at the point of installation or shall have an appropriate contact gap

(b) Shall not be able to falsely indicate that the contacts are open

(c) Shall clearly and reliably indicate the isolating position of the device

(d) Shall be designed and installed so as to prevent unintentional closure such as might be caused by impact, vibration or the like

(e) Shall be a device that disconnects all active conductors of the relevant supply

AND

(f) Shall be readily available.

$I_A = 2.0\angle 0$

$I_B = 1.5\angle -120$

$I_C = 1.5\angle +120$

$\overline{I_N} = \overline{I_A} + \overline{I_B} + \overline{I_N}$

$= 2.0\angle 0 + 1.5\angle -120 + 1.5\angle 120$

$= 2.0 + j0 + 1.5(\cos 120 - j\sin 120)$

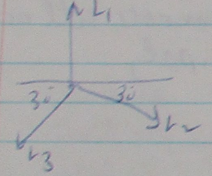
$+ 1.5(\cos 120 + j\sin 120)$

$= 2.0 + j0 + 1.5(-0.5 - j0.866) + 1.5(-0.5 + j0.866)$

$= 2.0 - 0.75 - j1.299 - 0.75 + j1.299$

$= 2.0 - 1.5 = 1.3\ A$ ✗

$I_N = \sqrt{I_A^2 + I_B^2 + I_C^2 - I_A I_B - I_A I_C - I_B I_C}$



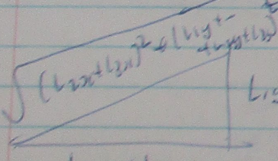
$L_{1y} = L_1 \quad L_{1x} = 0$

$L_{2y} = -L_2 \sin 30 = -\frac{1}{2} L_2$

$L_{2x} = -L_2 \cos 30 = -\sqrt{3}/2\ L_2$

$L_{3y} = -L_2 \sin 30 = -\frac{1}{2} L_3$

$L_{3x} = L_3 \cos 30 = \sqrt{3}/2\ L_3$



$L_N^2 = (\sqrt{3}/2\ L_3 - \frac{\sqrt{3}}{2} L_2)^2 + (L_1 - \frac{1}{2} L_2 - \frac{1}{2} L_3)^2$

Factoring out $\sqrt{3}/2$ and $1/2$

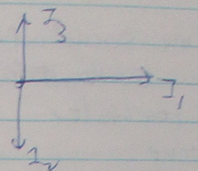
$= \frac{3}{4}(L_3 - L_2)^2 + (L_1 - \frac{1}{2}(L_2 + L_3))^2$

Expanding square

$= \frac{3}{4}(L_2^2 + L_3^2 - 2L_2L_3) + (L_1^2 + \frac{1}{4}(L_2^2 + L_3^2 + 2L_2L_3)$
$- L_1(L_2 + L_3)$

$= \frac{3}{4}L_2^2 + \frac{3}{4}L_3^2 - \frac{3}{2}L_2L_3 + L_1^2 + \frac{1}{4}L_2^2 + \frac{1}{4}L_3^2$
$+ \frac{1}{2}L_2L_3 - L_1L_2 - L_1L_3$

$L_N^2 = L_1^2 + L_2^2 + L_3^2 - L_1L_2 - L_1L_3 - L_2L_3$



$I_L = \sqrt{I_1^2 + (I_3 - I_2)^2}$

$\phi = \cos^{-1} \frac{I_1}{I_L}$

3rd Harmonic current (and odd multiplied there of) are additive to the normal 50Hz current to be carried there fore it may be necessary for the capacity of neutral conductor to be greater than that of the associated active conductors 3.5.2.

$V_{NO} = \frac{V_A Y_A + V_B Y_B + V_C Y_C}{Y_A + Y_B + Y_C} = \frac{\frac{V_A}{Z_A} + \frac{V_B}{Z_B} + \frac{V_C}{Z_C}}{\frac{1}{Z_A} + \frac{1}{Z_B} + \frac{1}{Z_C}}$

$V_{AO} = V_{AN} - V_{NO}$

Glog Fault

Ⓐ Scenario 1 — HWS E-N Shortcut
—— 2 HWS High Earth Resistance

Ⓑ Scenario 1 Open cct Earth | Flourescent Lamp
—— 2 —— Blinking

Ⓒ Split phase motor
Scenario 1 — Open cct Active
—— 2 — Open cct Neutral

Ⓓ 3φ motor Scenario 1. A phase open
—— 2 — CB Tripping (B-C Short cut)

Ⓔ Electrical Installation
Scenario 1 — A-N Short
—— 2 —— High Earth resistance

Cct Detail
Type C
25mm2
20A
2core + Earth

EL0018 4.3

Two bedrooms Unit

14 Lighting points, 16 x 10A double socket outlet
1 x 120 W, 230V Bathroom exhaust fan
1 x 12 kW Instantaneous water heater
9.2 kW, 230V electric stove
4.4 kW, 230V Split system Aircon

Three bedrooms Unit

19 Lighting points, 18 x 10A double socket outlet
2 x 120 W 230V Bathroom exhaust fan
1 x 6.2 kW 230V electric cooktop
1 x 12 kW, 230V instantaneous water heater
1 x 5.2 kW, 230V split system A/C
1 x 3.6 kW 230V electric wall oven

2 bedroom Table C1 col 2

Load	Load group	cal	max Demand
14 Light point + 1 Exh fan	a(i)	3A.	3
16 x 10A double socket outlet	b(i)	16 x 2 = 32 10 + 5	15
1 x 12 kW Instantaneous water heater	e	33.3% $\frac{0.333 \times 12 \times 10^3}{230}$	17.37
9.2 kW 230V electric stove	c	50% $\frac{0.5 \times 9.2 \times 10^3}{230}$	20
4.4 kW 230V Split system Aircon	d	75% $\frac{0.75 \times 4.4 \times 10^3}{230}$	14.34
			69.71

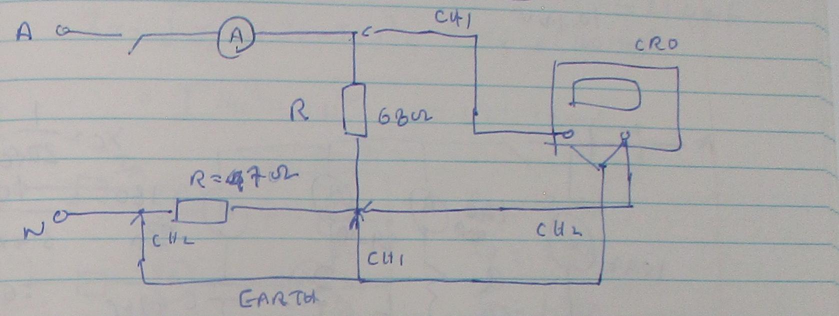
3 bedroom

19 Light pt + 2 exh fan } 21	a(i)	= 3 + 2 = 5	5
1 x 6.2 kW, 230V cooktop	c	50% = $\frac{0.5 \times 6.2 \times 10^3}{230}$	13.47
1 x 12 kW 230V Inst water heater	e	33.3% = $\frac{0.333 \times 12 \times 10^3}{230}$	17.37
1 x 5.2 kW 230V Split AC	d	75% = $\frac{0.75 \times 5.2 \times 10^3}{230}$	16.95
1 x 3.6 kW, 230V oven	c	50% = $\frac{0.5 \times 3.6 \times 10^3}{230}$	7.82

18 x 10A double socket outlet	b(i)	18 x 2 = 36 10 + 5	15

75.6 A

EL0020 Task A CRO measurement



Sweep time 5 ms/DIV
voltage selector Ch 1 & 2 5V/DIV
vertical time selector Ch1 AC
mode selector Ch1, Trigger selector Ch1

R = 68Ω
R_2 = 49Ω

Table A1

Attempt	Voltage vs Vdt	Current I mA	P-P Supply V	P-V R2 V	Period Time
1st	10V 10.15V	75mA	14.8V 2.3div	9.15V 8.85V	10.3ms

Q1 $V_{max} = I \times R = 75 \times 10^{-3} \times [68 + 47] = 75 \times 10^{-3} \times = 8.625$ A

Measured result $V_1 = 8.62 \to 8.81V$

Q2 $f = \frac{1}{T} = \frac{1}{10ms} = 100$ HZ — IT is the freq provided by vcevic. Supply freq is 50Hz

Q3 $V_{inst} = \frac{V_{p-p}}{2} \times \sin 110 = \frac{8.85}{2} \times \sin 110 = 3.83V$

$V_d = at$

Q4 $V_{Rms} = \frac{V_{max}}{\sqrt{2}} = \frac{14.8}{1.414} = 10.46V$ | volt med 10.12V

Q5 - Single wave

Task C ~ LV Parallel RL circuit

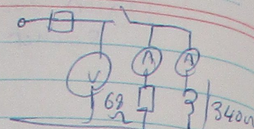
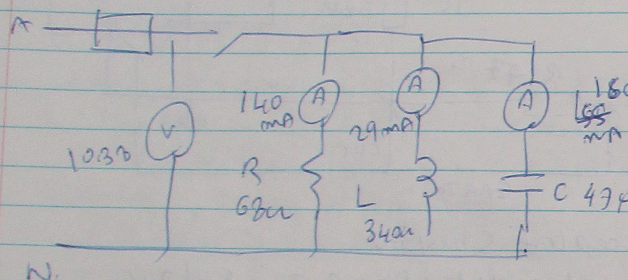


Table C2

Supply voltage 10.12V

$I_R = 140$ mA $I_L = 29$ mA



$X_C = \frac{1}{2\pi f c} = \frac{10^6}{314 \times 47}$

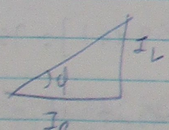
$= 67.75 \Omega$

$I_c = \frac{10}{67.75} = 14$ mA

Table C2

Attempt	Supply voltage V_T	Branch current I_R	I_L	I_c
1st	10.38V	140mA	29mA	160mA

Task D 3φ unbalanced Y connected load



$I_T = \sqrt{I_R^2 + I_L^2} = \sqrt{140^2 + 29^2}$

$= 142.9$

$X = \frac{I_R}{I_T} = \frac{140}{142.9} = 0.979$

$\phi_1 = \cos^{-1} 0.77 = 39.6$

$\phi_2 = \cos^{-1} 0.95$ $I_x = I_R(\tan\phi_1 - \tan\phi_2)$

$= 18.19'$ $= 140(\tan 39.6 - \tan 18.19)$

$= 140(0.827 - 0.328)$

$= 140 \times 0.499$

$= 70$ mA

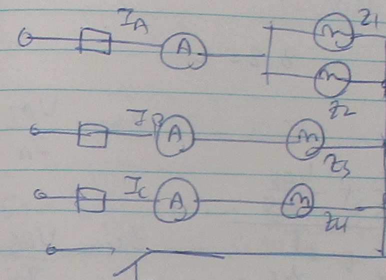
$X_C = \frac{V}{I_{XC}} = \frac{10.38}{70 \times 10^{-3}} = 148.28\ \Omega$

$X_C = \frac{1}{2\pi f c} \rightarrow c = \frac{1}{2\pi f X_C} = \frac{10^6}{314 \times 148.28}$

$= 21.4 \mu F$

$I_T = \sqrt{I_R^2 + (I_C - I_L)^2} = \sqrt{140^2 + (160-29)^2}$

$= \sqrt{140^2 + 131^2} = 191.73$ mA



$I_A = 2.5A$

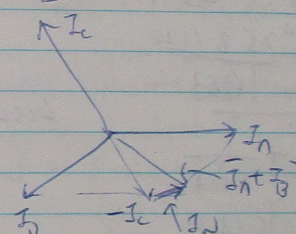
$I_B = 1.8A$

$I_C = 1.75A$

$V_{AS} = 16.7V$

$V_{BS} = 25.3V$

$V_{CS} = 25.8V$



$I_N = \sqrt{I_A^2 + I_B^2 + I_c^2 - I_A I_B - I_B I_c - I_c I_A}$

$= \sqrt{2.5^2 + 1.8^2 + 1.75^2 - 2.5 \times 1.8 - 1.8 \times 1.75 - 1.75 \times 2.5}$

$= \sqrt{0.525} = 0.7211$ Amp

only for resistive load

Another method

$\bar{I}_N = \bar{I}_A + \bar{I}_B + \bar{I}_c$

$\bar{I}_N = 2.5\angle 0 + 1.8\angle -120 + 1.75\angle +120$

$= 2.5 + 1.8[\cos(-120) + j\sin(-120)] + 1.75[\cos 120 + j\sin 120]$

$= 2.5 + 1.8(-0.5 - j0.866) + 1.75(-0.5 + j0.866)$

$= 2.5 - 0.9 - j1.55 - 0.875 + j1.5155$

$= 0.725$ 3 results agreed.

Voltage difference between supply neutral point and load λ point

$$V_N = \sqrt{V_{AS}^2 + V_{BS}^2 + V_{CS}^2 - V_{AS}V_{BS} - V_{BS}V_{CS} - V_{AS}V_{CS}}$$

$$= \sqrt{16.7^2 + 25.3^2 + 25.8^2 - 16.7 \times 25.3 - 25.3 \times 25.8 - 16.7 \times 25.8}$$

$$= \sqrt{1584.62 - 1506.11}$$

$$= \sqrt{78.51} \qquad 8.86\ V$$

Another method

$$V_{NO} = \frac{\frac{V_{AS}}{Z_{AS}} + \frac{V_{BS}}{Z_{BS}} + \frac{V_{CS}}{Z_{CS}}}{\frac{1}{Z_{AS}} + \frac{1}{Z_{BS}} + \frac{1}{Z_{CS}}}$$

$Z_{AS} = \frac{V_{AS}}{I_A} = \frac{16.7}{2.5} = 6.68$

$Z_{BS} = \frac{V_{BS}}{I_B} = \frac{25.3}{1.8} = 14.05$

$Z_{CS} = \frac{V_{CS}}{I_C} = \frac{25.8}{1.75} = 14.7$

$$= \frac{\frac{16.8\angle 0}{6.68} + \frac{25.3\angle -120}{14.05} + \frac{25.8\angle 120}{14.7}}{\frac{1}{6.68} + \frac{1}{14.05} + \frac{1}{14.7}}$$

$$= \frac{2.5\angle 0 + 1.8\angle -120 + 1.75\angle 120}{0.149\angle 0 + 0.0711\angle -120 + 0.068\angle 120}$$

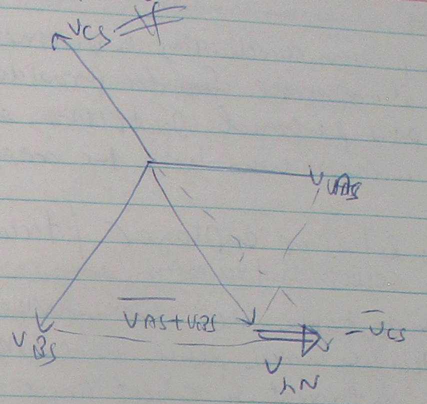
$$= \frac{~~6.05~~}{~~0.288~~} = ~~21.0~~$$

$$= \frac{2.5(1) + 1.8(\cos(-120) + j\sin(-120)) + 1.75(\cos 120 + j\sin 120)}{0.149 + 0.0711(\cos -120 + j\sin -120) + 0.068(\cos 120 + j\sin 120)}$$

$$= \frac{2.5 + (-0.9 - j1.56) - 0.875 + j1.5155}{0.149 + 0.0711(-0.5 - j0.866) + 0.068(-0.5 + j0.866)}$$

$$= \frac{0.725}{~~0.288~~} = ~~2.51\ V~~ \qquad \frac{0.725}{0.149 - 0.0355 - j0.0615 - 0.034 + j0.058}$$

$$\frac{0.725}{0.0795} = 9.11\ V$$



UEECD0007 1.4 Select PPE

- Safety glasses – Protect the eyes from projectiles and sparks
- Goggles – Protect the eye and face from projectiles, & sparks
- Ear muffs – Protect the ears from excessive noise.
- Ear plugs – Protect the ears from excessive noise
- Hard hat – Protect the head from falling objects and hard or sharp edges
- High visibility vest – make the person more visible to others

PPE to energy light replacement

Insulation glove, safety vest, safety glasses

① Importance of PPE

PPE is worn to minimize exposure to hazards that cause serious workplace injuries and illness

The person responsible for PPE in work place

The ~~can~~ person conducting a business(or) undertaking (PCBU) is responsible ~~for~~ for providing, replacing, and paying ~~for~~ personal protective equipment as well as workers who have the responsibilities with PPE.

responsibilities or employer / trainer in PPE select a training

- Select suitable PPE for workers / trainees for specific work place a work environment
- Provide information about how to use PPE.
- periodically assess whether the PPE is and continues to be effective.
- Put up signs about PPE.

CQ 0037 S.2 Ladder safety Check

replace low leg days light

Falling from heights ~~D/H~~ D | M-H use correct ladder and inspection

Falling objects D | M-H carry tools in a tool belt, pouch or holster not in your hands so you can keep hold of the ladder.

Electricity D | H ~~Is~~ Isolation

Slip, trip, fall D | M Housekeeping

Appropriate ladder for the work task Scenario
- Bailey ladder 3m, 13.5kg, Aluminium multipurpose ladder.

visual Inspection

Are the feet of the ladder undamaged and free from any grease or dirt.
Are the rungs of the ladder undamaged and free from any grease or dirt.)
Are the stiles of the ladder undamaged and free from any grease or dirt?
Is the cross brace undamaged and free ~~the~~ from any grease or dirt?
Are all nuts, bolts, and/or rivets secure and in good condition.

Compliance Check

Does the ladder have a current safety tag?
Does the ladder indicate that it was made to Australian Standards?
Is the ladder appropriate to the task?
Does the ladder have a label showing safe working load?

Setting up

Do you know how to safely carry, ~~erect~~ erect and work from the ladder.
Are all feet of the ladder stable and secure on the ground?
Is the cross brace securely locked in position
Are all safety barricades and/or signage position

Safety risks posed by working at height

- Falls are major cause of death and serious injury including sprains and strains, cuts and lacerations. concussion and unconsciousness broken bones, internal bleeding, impalement ~~de~~ death.

The factors need to be taken into consideration when selecting a ladder ~~for~~ ofor given task.
- whether or not it is absolutely necessary to use a ladder for the work.
- the load that the ladder will be ~~required~~ to support
- Presence of electrical hazards.

safety precautions that should be followed when climbing [or] working from a ladder.
- only one person at a time should use or work from a ladder.
Always face the ladder when ascending or descending it.
mountain 3 points of contact on the ladder at any one.
- carry tools in a tool bag not in hands.
- Do not climb higher than the third rung from the top of the ladder.
- If the ladder is needed to place in front of a door either lock the door, secure the door open or have a second person guard the door way on the other side.
- Never walk a ladder whilst standing on it. Get ~~down~~ down off the ladder ~~at~~ and carry it to the desired location.

S.3 Develop JSA / JHA for using Scaffold

~~Hazards~~ Hazards
Fall from the height D/H use scaffold with good condition
Electrocution D/H use safety insulated glove.

Anchored Safety harness
Operate an elevated work platform (EWP) such as scissor lift or boom Lift, anchor safety harness need to be ~~all~~ utilized

Precaution working on mobile scaffold
- The casters should be locked when a person is on any part of the scaffold.
The work platform should only be accessed via the ladder and trap door provided.
Toboards should be ~~used~~ used to reduce the chance of objects falling from the work platform.
- Handrail and kickboards must be used on all working platforms more than 2m high.
- only perform the work that is within arms reach of the scaffold - don't over extend.
- Never step on the toe boards or safety rails of the scaffold to gain extra height

9-3 Apply Emergency First Aid

Danger at the place of incidence D/H Assess the danger
Hazardous Situation - D/H - Assess the hazardous condition
Electrical hazard D/H check electrical line wire isolation

Step by step process to assess the incident and vital signs and ~~in~~ injuries of those involved.
- Assess the situation and any potential danger
- Try to get a response from casualty by squeezing their shoulder.
- Assess casualty condition, looking for any visual sign
- Assess casualty condition, looking for any visual sign
Prioritize the treatment based on the risk posed

by each.
- Assess ✶ consciousness, send for help.
- Provide airways, re assess breathing.
- Provide cardio pulmonary resuscitation (CPR)
- Provide defibrillation.

1/ Time frame of CPR

One cycle of CPR consists of 30 compressions followed by 2 breaths. Compressions should be at a rate of approximately 100 per minute.

2/ S - Stands for, should you still take this step if you are by yourself.
- S - Send for help by calling triple zero
- It should still be taken.

3/ Should you perform CPR on casualty that you suspect of having spinal injuries.
Can provide modified CPR whilst protecting the spine. Do not tilt the head back to open airways.

EL0005 Y/Δ starter