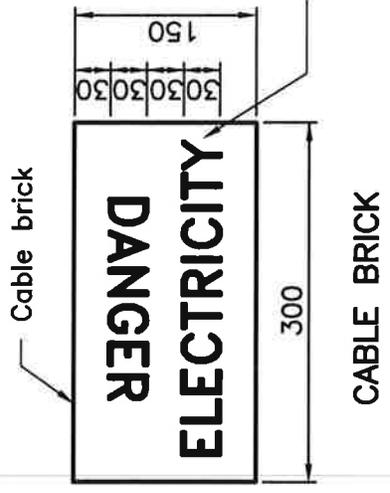
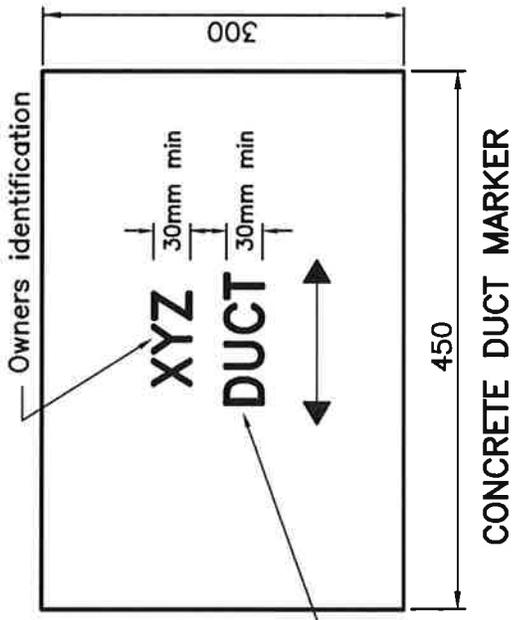
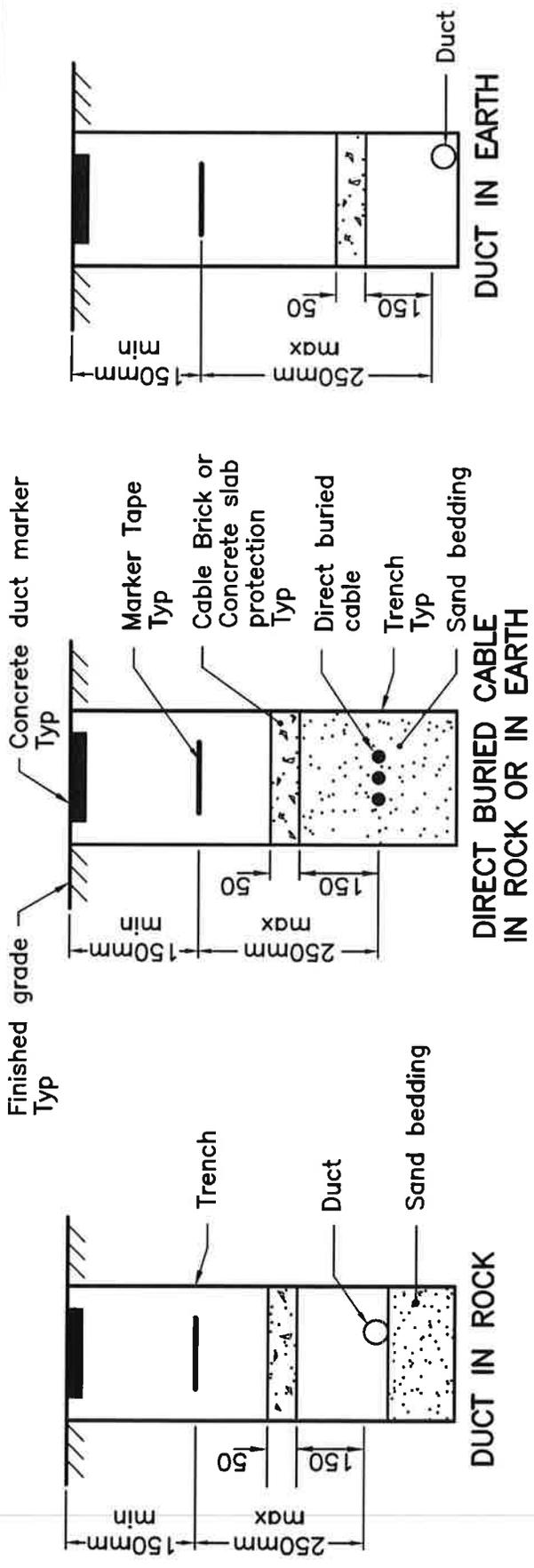


Project No. R. 067361.001
DES ALLUMETTES BRIDGE
SINGLE-LANE TRAFFIC IMPLEMENTATION

Appendix A
ELECTRICAL DETAILS



NOTES:

- A This standard to be read in conjunction with OPSP-2100.01, and 2101.01.
- B All dimensions are in millimetres or metres unless otherwise shown.

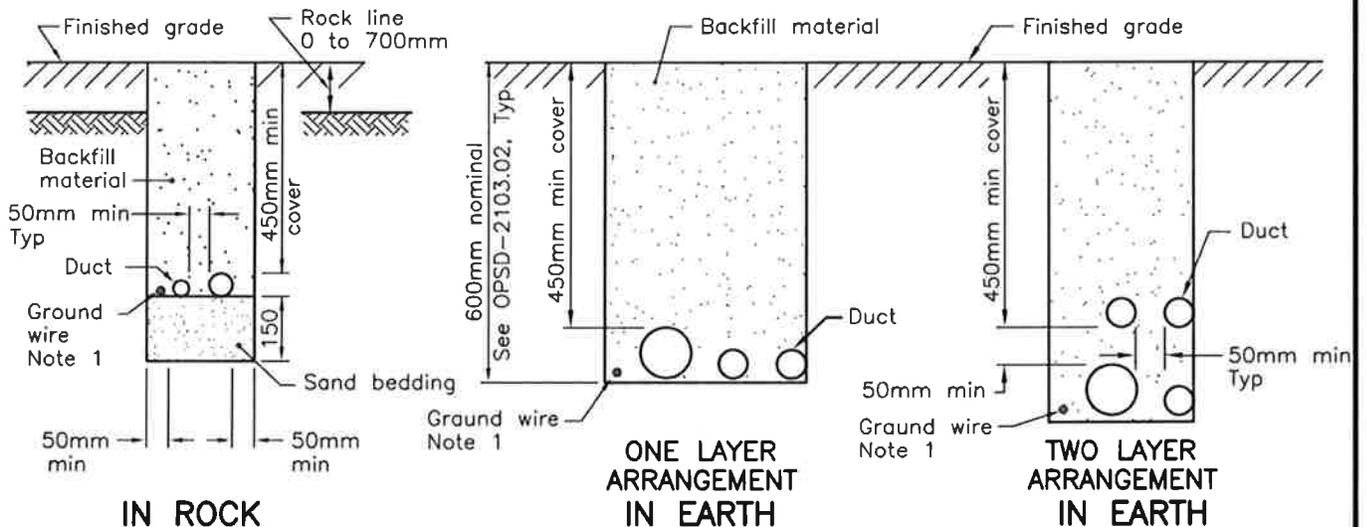
ONTARIO PROVINCIAL STANDARD DRAWING		Date	1992 12 15	Rev	1
CABLE AND DUCT PROTECTION AND MARKING		Date -----			
		OPSD - 2100.05			

**TABLE 1
MINIMUM TRENCH WIDTH FOR ONE LAYER AND
TWO LAYER DUCT ARRANGEMENT**

No OF 100 mm DUCTS	No OF LAYERS	NUMBER OF 50 mm DUCTS										
		0	1	2	3	4	5	6	7	8	9	10
0	1	N/A	150	205	300	460	610	N/A	N/A	N/A	N/A	N/A
	2	N/A	N/A	N/A	N/A	205	300	350	460	460	610	610
1	1	150	255	460	610	610	N/A	N/A	N/A	N/A	N/A	N/A
	2	N/A	N/A	205	255	300	460	460	610	610	610	N/A
2	1	300	460	610	N/A							
	2	150	255	255	460	460	610	610	610	N/A	N/A	N/A
3	1	460	610	N/A								
	2	300	300	460	460	610	610	610	N/A	N/A	N/A	N/A
4	1	610	N/A									
	2	300	460	460	610	610	N/A	N/A	N/A	N/A	N/A	N/A

NOTES:

- 1 Install ground wire in the duct, or trench as indicated in the contract.
- A Install cable brick, or concrete slab, marker tape, concrete duct marker where indicated in the contract. See OPSD-2100.05.
- B This drawing is used in conjunction with OPSD-2103.02.
- C Contractor has the option of installing one, or two layer duct arrangement.
- D N/A - Not Applicable, undesirable, or exceeding equipment limits.
- E All dimensions are in millimetres or metres unless otherwise shown.



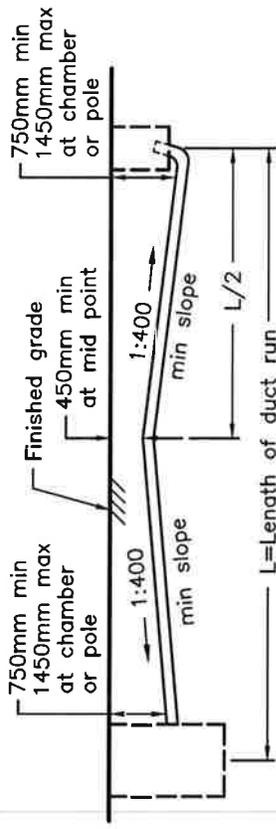
ONTARIO PROVINCIAL STANDARD DRAWING

Date 1992 12 15 Rev

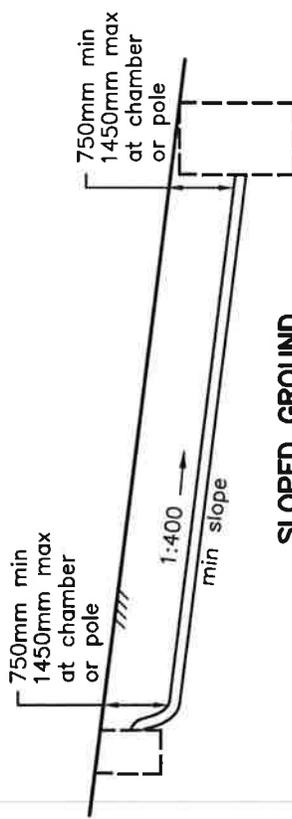
**DUCT INSTALLATION
IN TRENCHES**

Date _____

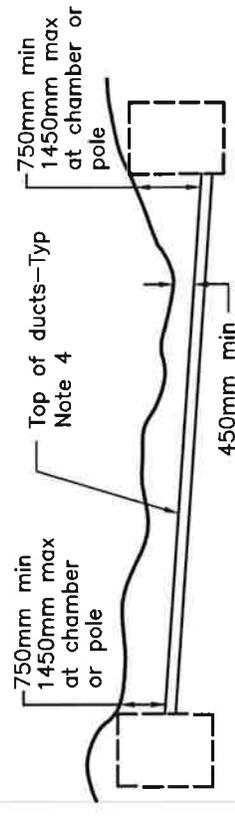
OPSD - 2101.01



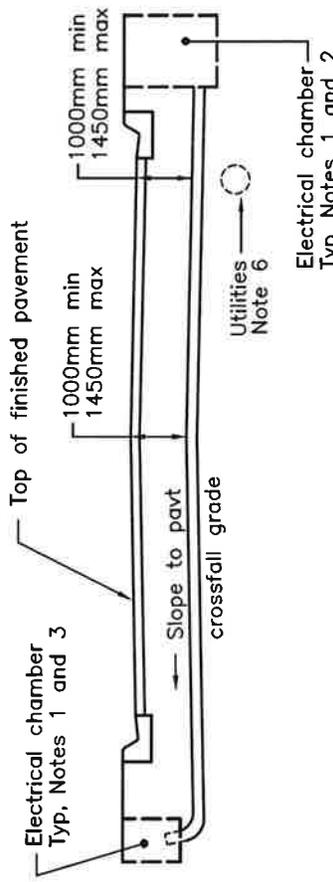
FLAT GROUND



SLOPED GROUND



UNEVEN GROUND

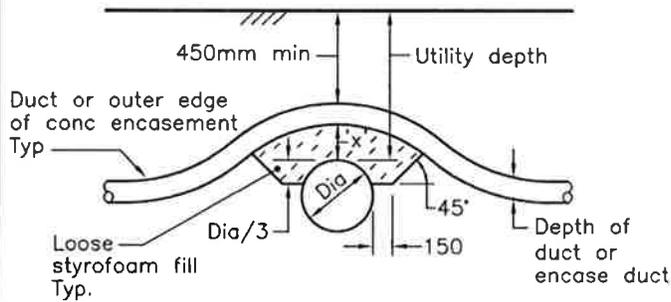


OPEN TRENCH METHOD ACROSS ROADWAYS
Note 5

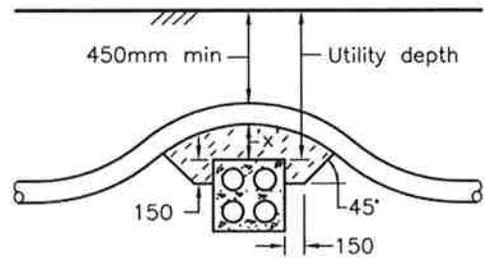
NOTES:

- 1 For type and size of electrical chambers, see layout drawings.
 - 2 For duct connection to electrical maintenance hole, see OPSD-2123.01 and 2123.02.
 - 3 For duct connection to electrical handholes, see OPSD-2123.03.
 - 4 Depth of cover given is to top of direct buried ducts, or to top of concrete encasement.
 - 5 For subsurface and underpavement installation, the cover shall be 1000mm min and 1450mm max measured from the top of steel encasement, or duct to the finished grade.
 - 6 For treatment at utility crossings, see OPSD-2103.05.
- A All dimensions are in millimetres or metres unless otherwise shown.

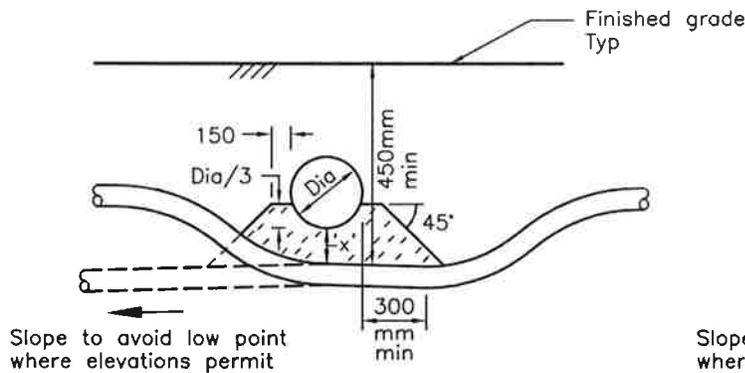
ONTARIO PROVINCIAL STANDARD DRAWING		Date	1992 12 15	Rev
DUCT INSTALLATION PROFILES		Date -----		
		OPSD - 2103.02		



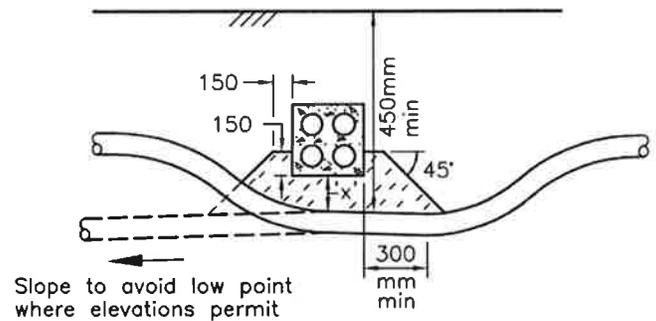
CROSSING OVER UTILITY



CROSSING OVER CONCRETE ENCASED UTILITY



CROSSING UNDER UTILITY



CROSSING UNDER CONCRETE ENCASED UTILITY

NOTES:

A The required clearance 'x' between the utility and the ducts or concrete encasement is:

UTILITY	'x' mm min
Ducts, Direct Buried or Encased	100
All other pipes	300
High Voltage cables	300
All other cables	300

B Trench widths shall be kept to the minimum required for working space. Manual excavation and backfill methods shall be used, with the utility supported in place where required, where crossing under a utility is necessary.

C All dimensions are in millimetres or metres unless otherwise shown.

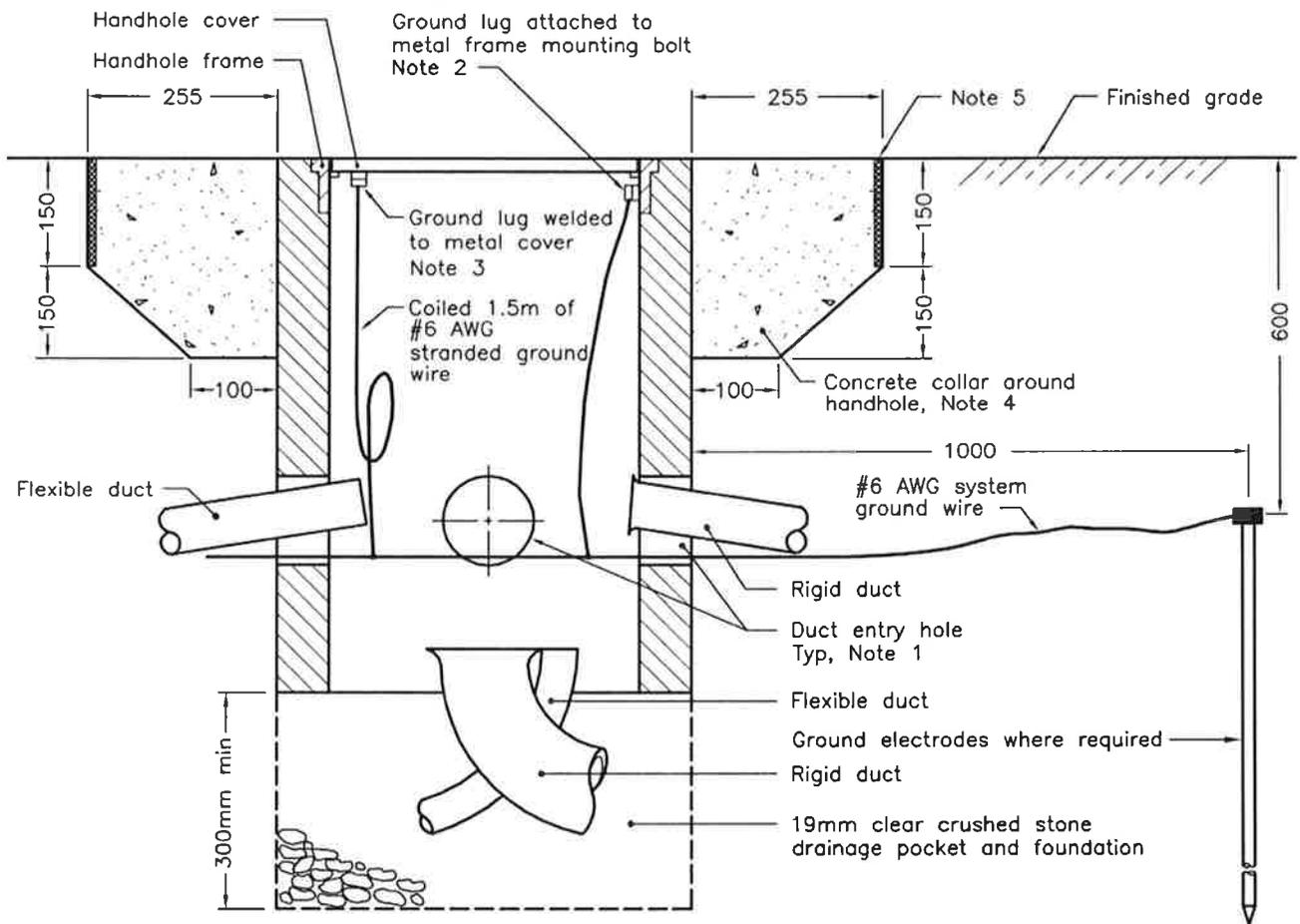
ONTARIO PROVINCIAL STANDARD DRAWING

Date 1992 12 15 Rev

**DUCT INSTALLATION
AT UTILITY CROSSINGS**

Date _____

OPSD - 2103.05



NOTES:

- 1 For duct entry details see OPSD 2123.03.
 - 2 For handholes with metal frames, ground wire shall be attached to frame using a ground lug suitable for #6 AWG stranded copper wire.
 - 3 For handholes with metal covers and non-metallic frames, the ground wire shall be attached to the handhole cover using a ground lug suitable for #6 AWG copper wire.
 - 4 Concrete collar is required around the complete perimeter of all electrical handholes except:
 - a) concrete electrical handholes, or
 - b) handholes installed in concrete pavement or sidewalk.
 - 5 In raised traffic islands, install 12mm expansion board at back of curb and install concrete collar to suit.
- A For specific handhole details see OPSD 2112.01, 2112.02, 2112.030, 2112.040, 2112.05, and 2113.010.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

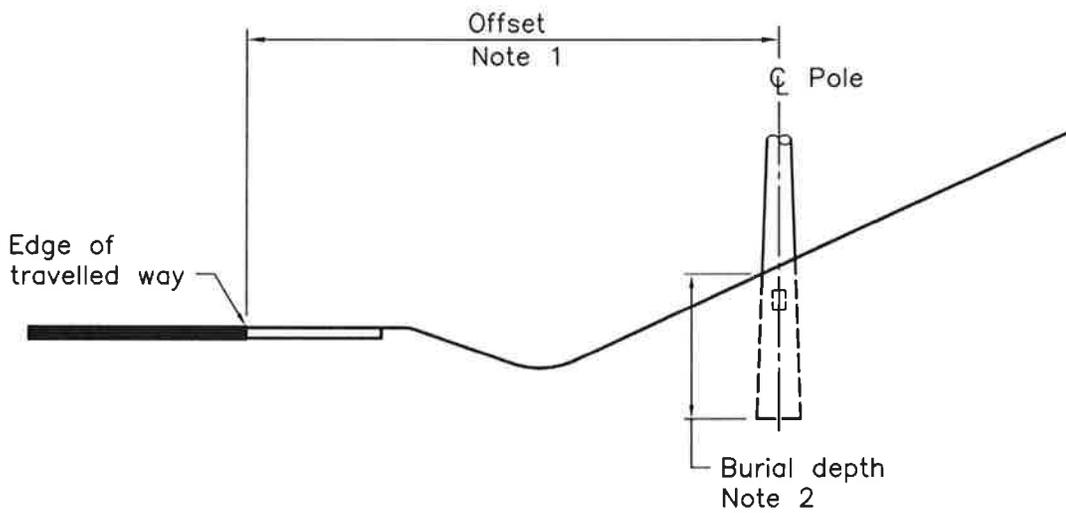
Nov 2009

Rev 2

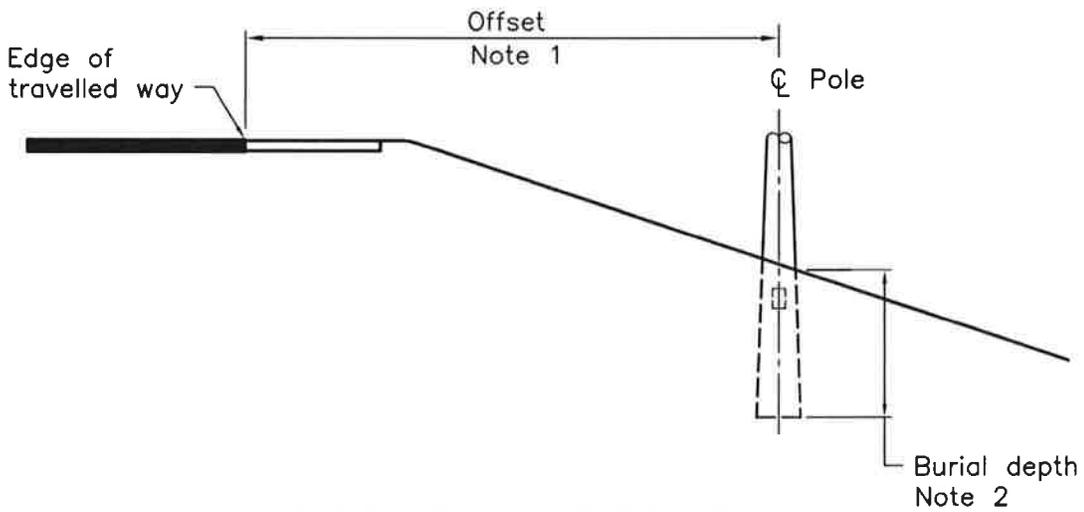
ELECTRICAL HANDHOLES
GENERAL INSTALLATION REQUIREMENTS



OPSD 2117.02



DIRECT BURIED POLE IN CUT



DIRECT BURIED POLE IN FILL

NOTES:

- 1 Offset dimension as specified.
- 2 Burial depth shall be measured from the lowest grade elevation at pole.
- 3 This OPSD to be read in conjunction with OPSD 2225.010, 2232.010, and 2238.01.

ONTARIO PROVINCIAL STANDARD DRAWING

April 2007 Rev 1

**INSTALLATION OF
DIRECT BURIED POLES IN SLOPES**



OPSD 2210.020

TABLE 1 MINIMUM LEAD SETTINGS
SINGLE GUY ANCHORS FOR GUY No. 1

Span, m	6.00	6.60	7.20	7.80	8.40	9.00	9.60	10.20
Pole attachment height, m	5.00	5.60	6.20	6.80	7.40	8.00	8.60	9.20
30	2.45	2.50	2.75	3.00	3.20	3.40	3.60	3.85
40	2.95	2.60	3.10	3.35	3.60	3.85	4.10	4.35
50	2.80	3.10	3.40	3.65	3.90	4.15	4.40	4.70
60	3.20	3.50	3.80	4.10	4.40	4.70	5.00	5.30
70	3.35	3.75	4.15	4.55	4.95	5.35	5.75	6.15
80	2.90	3.20	3.50	3.80	4.05	4.35	4.65	4.95
90	3.10	3.40	3.75	4.00	4.35	4.65	4.95	5.25

TABLE 2 MINIMUM LEAD SETTINGS
DOUBLE GUY ANCHORS FOR GUY No. 1

Span, m	6.00	6.60	7.20	7.80	8.40	9.00	9.60	10.20
Pole attachment height, m	5.00	5.60	6.20	6.80	7.40	8.00	8.60	9.20
30	2.80	3.10	3.40	3.70	4.05	4.40	4.75	5.10
40	3.20	3.50	3.85	4.15	4.45	4.80	5.15	5.50
50	3.50	3.85	4.20	4.55	4.90	5.25	5.60	5.95
60	4.00	4.35	4.75	5.10	5.45	5.80	6.15	6.50
70	4.20	4.65	5.00	5.40	5.80	6.15	6.55	6.95
80	3.60	3.95	4.32	4.70	5.05	5.40	5.80	6.15
90	3.65	4.25	4.65	5.00	5.40	5.80	6.15	6.55

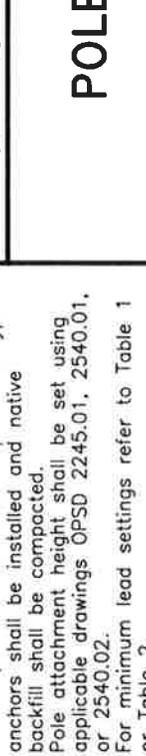
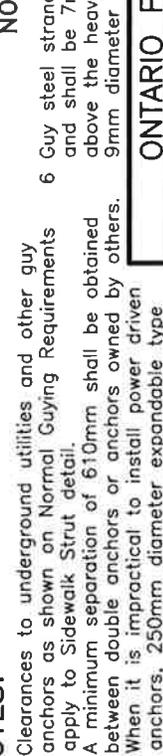
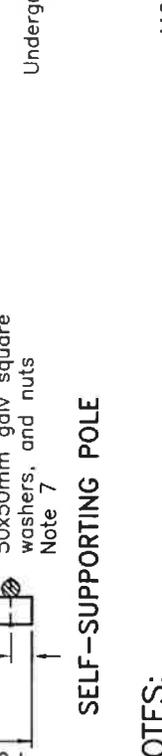
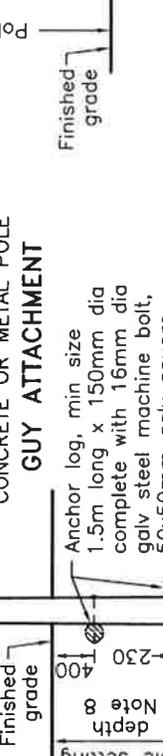
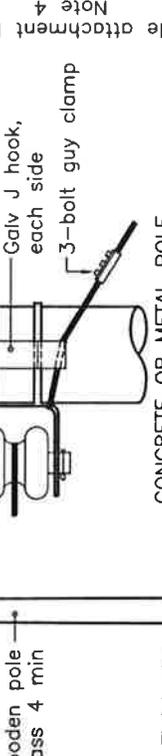
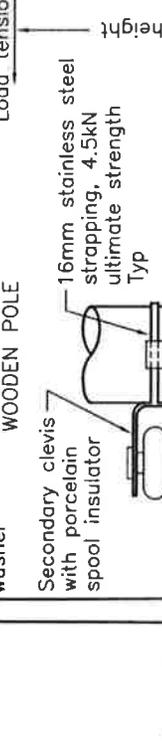
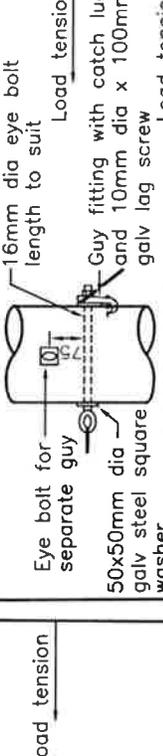
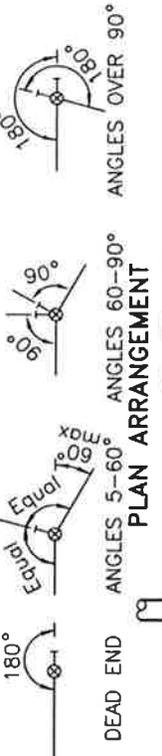


TABLE 1 MINIMUM LEAD SETTINGS
SINGLE GUY ANCHORS FOR GUY No. 1

Span, m	6.00	6.60	7.20	7.80	8.40	9.00	9.60	10.20
Pole attachment height, m	5.00	5.60	6.20	6.80	7.40	8.00	8.60	9.20
30	2.45	2.50	2.75	3.00	3.20	3.40	3.60	3.85
40	2.95	2.60	3.10	3.35	3.60	3.85	4.10	4.35
50	2.80	3.10	3.40	3.65	3.90	4.15	4.40	4.70
60	3.20	3.50	3.80	4.10	4.40	4.70	5.00	5.30
70	3.35	3.75	4.15	4.55	4.95	5.35	5.75	6.15
80	2.90	3.20	3.50	3.80	4.05	4.35	4.65	4.95
90	3.10	3.40	3.75	4.00	4.35	4.65	4.95	5.25

TABLE 2 MINIMUM LEAD SETTINGS
DOUBLE GUY ANCHORS FOR GUY No. 1

Span, m	6.00	6.60	7.20	7.80	8.40	9.00	9.60	10.20
Pole attachment height, m	5.00	5.60	6.20	6.80	7.40	8.00	8.60	9.20
30	2.80	3.10	3.40	3.70	4.05	4.40	4.75	5.10
40	3.20	3.50	3.85	4.15	4.45	4.80	5.15	5.50
50	3.50	3.85	4.20	4.55	4.90	5.25	5.60	5.95
60	4.00	4.35	4.75	5.10	5.45	5.80	6.15	6.50
70	4.20	4.65	5.00	5.40	5.80	6.15	6.55	6.95
80	3.60	3.95	4.32	4.70	5.05	5.40	5.80	6.15
90	3.65	4.25	4.65	5.00	5.40	5.80	6.15	6.55

TABLE 3 MINIMUM LEAD SETTINGS
TRIPLE GUY ANCHORS FOR GUY No. 1

Span, m	6.00	6.60	7.20	7.80	8.40	9.00	9.60	10.20
Pole attachment height, m	5.00	5.60	6.20	6.80	7.40	8.00	8.60	9.20
30	3.20	3.50	3.85	4.15	4.45	4.80	5.15	5.50
40	3.60	3.95	4.30	4.65	4.95	5.30	5.65	6.00
50	4.00	4.35	4.70	5.05	5.40	5.75	6.10	6.45
60	4.40	4.75	5.10	5.45	5.80	6.15	6.50	6.85
70	4.60	5.00	5.40	5.80	6.20	6.60	7.00	7.40
80	4.00	4.35	4.70	5.05	5.40	5.75	6.10	6.45
90	4.10	4.50	4.90	5.30	5.70	6.10	6.50	6.90

TABLE 4 MINIMUM LEAD SETTINGS
TRIPLE GUY ANCHORS FOR GUY No. 2

Span, m	6.00	6.60	7.20	7.80	8.40	9.00	9.60	10.20
Pole attachment height, m	5.00	5.60	6.20	6.80	7.40	8.00	8.60	9.20
30	3.20	3.50	3.85	4.15	4.45	4.80	5.15	5.50
40	3.60	3.95	4.30	4.65	4.95	5.30	5.65	6.00
50	4.00	4.35	4.70	5.05	5.40	5.75	6.10	6.45
60	4.40	4.75	5.10	5.45	5.80	6.15	6.50	6.85
70	4.60	5.00	5.40	5.80	6.20	6.60	7.00	7.40
80	4.00	4.35	4.70	5.05	5.40	5.75	6.10	6.45
90	4.10	4.50	4.90	5.30	5.70	6.10	6.50	6.90

TABLE 5 MINIMUM LEAD SETTINGS
TRIPLE GUY ANCHORS FOR GUY No. 3

Span, m	6.00	6.60	7.20	7.80	8.40	9.00	9.60	10.20
Pole attachment height, m	5.00	5.60	6.20	6.80	7.40	8.00	8.60	9.20
30	3.20	3.50	3.85	4.15	4.45	4.80	5.15	5.50
40	3.60	3.95	4.30	4.65	4.95	5.30	5.65	6.00
50	4.00	4.35	4.70	5.05	5.40	5.75	6.10	6.45
60	4.40	4.75	5.10	5.45	5.80	6.15	6.50	6.85
70	4.60	5.00	5.40	5.80	6.20	6.60	7.00	7.40
80	4.00	4.35	4.70	5.05	5.40	5.75	6.10	6.45
90	4.10	4.50	4.90	5.30	5.70	6.10	6.50	6.90

TABLE 6 MINIMUM LEAD SETTINGS
TRIPLE GUY ANCHORS FOR GUY No. 4

Span, m	6.00	6.60	7.20	7.80	8.40	9.00	9.60	10.20
Pole attachment height, m	5.00	5.60	6.20	6.80	7.40	8.00	8.60	9.20
30	3.20	3.50	3.85	4.15	4.45	4.80	5.15	5.50
40	3.60	3.95	4.30	4.65	4.95	5.30	5.65	6.00
50	4.00	4.35	4.70	5.05	5.40	5.75	6.10	6.45
60	4.40	4.75	5.10	5.45	5.80	6.15	6.50	6.85
70	4.60	5.00	5.40	5.80	6.20	6.60	7.00	7.40
80	4.00	4.35	4.70	5.05	5.40	5.75	6.10	6.45
90	4.10	4.50	4.90	5.30	5.70	6.10	6.50	6.90

TABLE 7 MINIMUM LEAD SETTINGS
TRIPLE GUY ANCHORS FOR GUY No. 5

Span, m	6.00	6.60	7.20	7.80	8.40	9.00	9.60	10.20
Pole attachment height, m	5.00	5.60	6.20	6.80	7.40	8.00	8.60	9.20
30	3.20	3.50	3.85	4.15	4.45	4.80	5.15	5.50
40	3.60	3.95	4.30	4.65	4.95	5.30	5.65	6.00
50	4.00	4.35	4.70	5.05	5.40	5.75	6.10	6.45
60	4.40	4.75	5.10	5.45	5.80	6.15	6.50	6.85
70	4.60	5.00	5.40	5.80	6.20	6.60	7.00	7.40
80	4.00	4.35	4.70	5.05	5.40	5.75	6.10	6.45
90	4.10	4.50	4.90	5.30	5.70	6.10	6.50	6.90

- NOTES:**
- Clearances to underground utilities and other guy anchors as shown on Normal Guying Requirements apply to Sidewalk Strut detail.
 - A minimum separation of 610mm shall be obtained between double anchors or anchors owned by others.
 - When it is impractical to install power driven anchors, 250mm diameter expandable type anchors shall be installed and native backfill shall be compacted.
 - Pole attachment height shall be set using applicable drawings OPSD 2245.01, 2540.01, or 2540.02.
 - For minimum lead settings refer to Table 1 or Table 2.

- Anchor logs shall be pressure treated pine or western red cedar with preservative treatment according to CSA 080.
- For pole setting depths see OPSD 2238.01.
- Guards shall be complete with 3-50mm wide retroreflective bands according to ASTM D 4956, Type 1, spaced equally apart.
- This OPSD applies to low voltage and traffic signal installations only.
- All dimensions are in millimetres unless otherwise shown.

- NORMAL GUYING REQUIREMENTS**
- Guy steel strand shall be according to CAN/CSA G12 and shall be 7mm diameter Grade 110 for values above the heavy line in Table 1 and Table 2 and 9mm diameter Grade 160 for values below the line.

- SELF-SUPPORTING POLE**
- Anchor log, min size 1.5m long x 150mm dia complete with 16mm dia galv steel machine bolt, 50x50mm galv square washers, and nuts
Note 7
- Finished grade
- Pole setting depth
- 250
- 230
- 210
- 190
- 170
- 150
- 130
- 110
- 90
- 70
- 50
- 30
- 10
- 0
- Underground utility
- Notes 2 and 5
- 610mm min
- 610mm min
- 200mm dia helix anchor, power driven
Note 3
- 16mm dia x 2.13m long galv steel rod
- 16mm dia thimble eye nut
- 3-bolt guy clamp
- Serving sleeve
- 2.44m plastic guy guard, Note 9
- Alternate double guy locations
- Galv steel strand, Note 6
- Guy No. 1
- Guy No. 2
- Guy No. 3
- Preformed guy grip
- Strain insulator
- For attachment to pole see Guy Attachment details
- Galv steel pole with 10mm dia x 100mm galv lag screws
- Load tension
- 20° min
- 1.0 m min
- 180°
- 90°
- 90°
- Equal
- Equal
- 180°
- Angles 5-60°
- Angles 60-90°
- Angles over 90°
- PLAN ARRANGEMENT
- WOODEN POLE
- CONCRETE OR METAL POLE GUY ATTACHMENT
- SELF-SUPPORTING POLE
- WOODEN POLE
- CONCRETE OR METAL POLE
- SIDEWALK STRUT



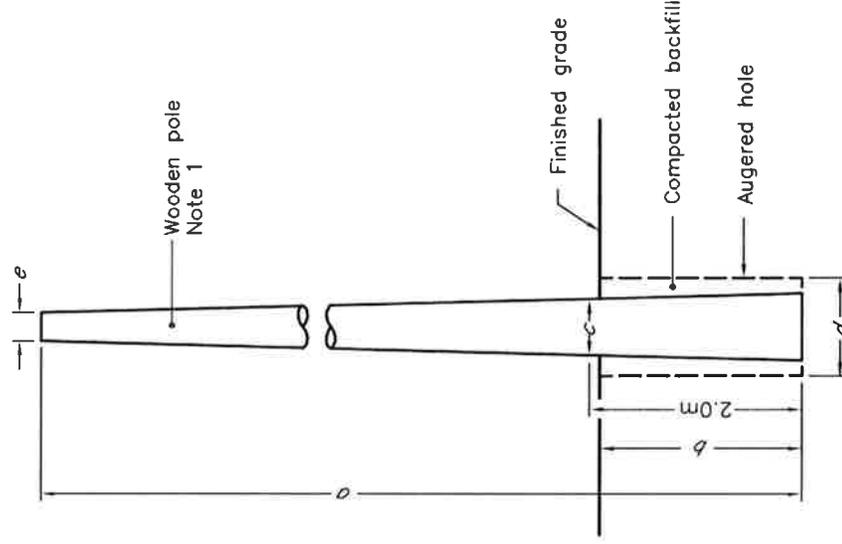
Nov 2012 Rev 2

ONTARIO PROVINCIAL STANDARD DRAWING

POLE GUYING DETAILS

OPSD 2235.01

Class of pole	Approximate breaking strength N	Pole length a m	Pole setting depth b m	Minimum diameter at c	Minimum augering diameter d	Minimum pole top diameter e
1	20,200	8.0	1.50	310	610	215
		9.5	1.65	330	685	
		11.0	1.80	350	685	
		12.5	1.95	370	685	
		14.0	2.10	390	760	
2	16,600	15.5	2.25	410	760	200
		17.0	2.40	430	760	
		18.5	2.55	440	760	
		8.0	1.50	290	610	
		9.5	1.65	310	610	
3	13,500	11.0	1.80	330	685	185
		12.5	1.95	350	685	
		14.0	2.10	370	685	
		15.5	2.25	390	710	
		17.0	2.40	400	710	
4	10,700	18.5	2.55	420	710	170
		8.0	1.50	245	560	
		9.5	1.65	265	610	
		11.0	1.80	290	610	
		12.5	1.95	310	610	
5	8,500	14.0	2.10	330	685	155
		15.5	2.25	340	685	
		17.0	2.40	350	685	
		18.5	2.55	360	685	
		8.0	1.50	230	560	
9.5	1.65	245	560			
11.0	1.80	265	610			
12.5	1.95	290	610			
14.0	2.10	310	610			



NOTES:

- 1 Length and class of pole as specified.
- A All dimensions are in millimetres unless otherwise shown.

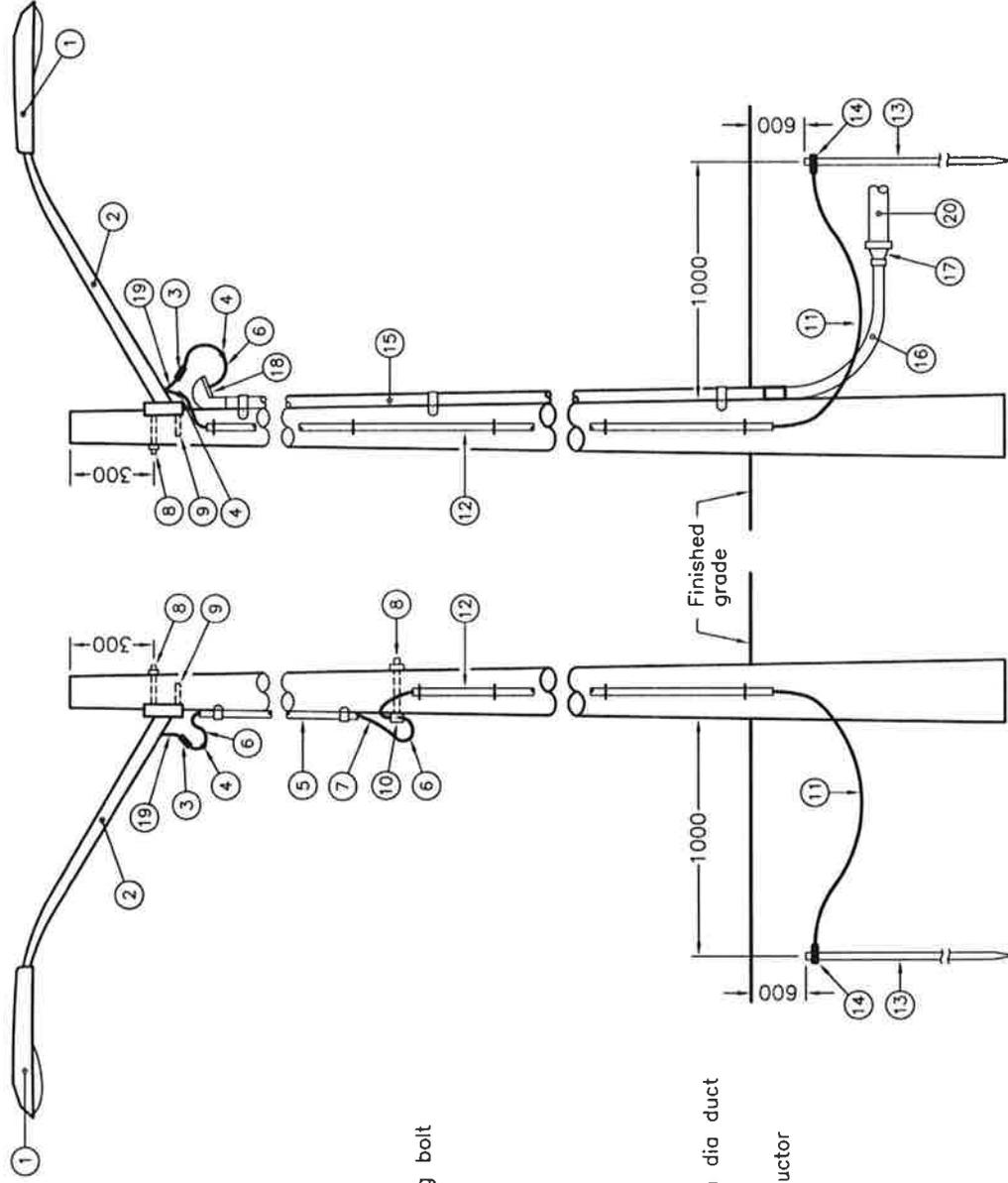
	ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev 1
	WOODEN POLE IN EARTH		
<div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 20px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100%; height: 20px;"></div>			OPSD 2238.01

MATERIALS:

- ① Luminaire
- ② Single or double elliptical bracket
- ③ 600V, 15A in line type fuse holder, complete with insulating boots
- ④ Compression connectors with insulating covers
- ⑤ 25mm rigid PVC conduit with PVC pipe straps
- ⑥ 150mm drip loop
- ⑦ Secondary aerial bus, 2-#12 AWG low voltage cables and #12 AWG ground conductor
- ⑧ 16mm dia galvanized through bolt, complete with 50x50mm square washer, lock washer, and nut
- ⑨ 12mm dia x 150mm long galvanized square head lag bolt
- ⑩ Spool and clevis with secondary aerial cable
- ⑪ #6 AWG ground conductor
- ⑫ Protective moulding stapled to pole
- ⑬ Ground rod
- ⑭ Ground rod connection
- ⑮ 32mm dia rigid PVC conduit with PVC pipe straps
- ⑯ 32mm dia rigid PVC 90° bend
- ⑰ Coupling from 32mm dia rigid PVC conduit to 50mm dia duct
- ⑱ Entrance fitting
- ⑲ #12 AWG low voltage cables and #12 AWG ground conductor
- ⑳ 50mm dia duct

NOTES:

- A Connect #12 AWG ground conductor to luminaire ground stud and secondary aerial bus.
- B Length of wood pole and pole setting depth as specified.
- C All dimensions are in millimetres unless otherwise shown.



OVERHEAD CIRCUIT

UNDERGROUND CIRCUIT

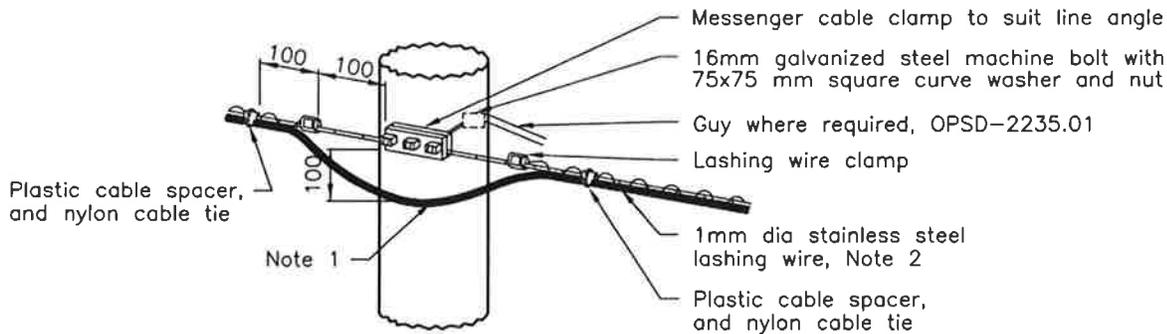
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2006 Rev 2

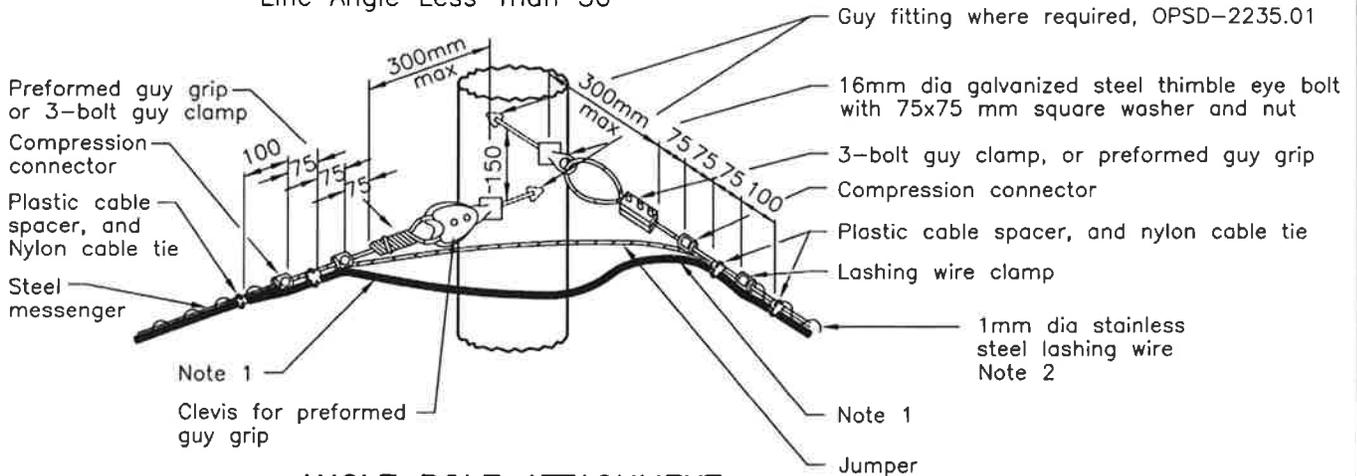
WOOD POLE WITH ELLIPTICAL BRACKET
OVERHEAD AND UNDERGROUND CIRCUITS



OPSD 2240.01



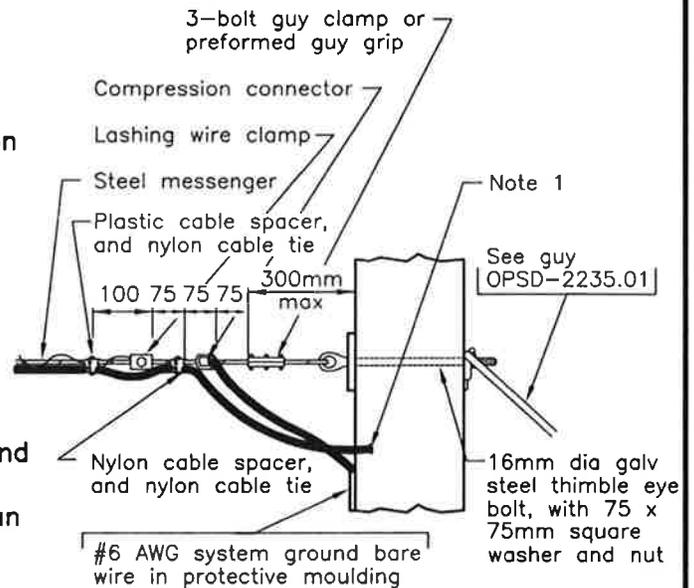
LINE POLE ATTACHMENT
Line Angle Less Than 30°



ANGLE POLE ATTACHMENT
Line Angle Greater Than 30°

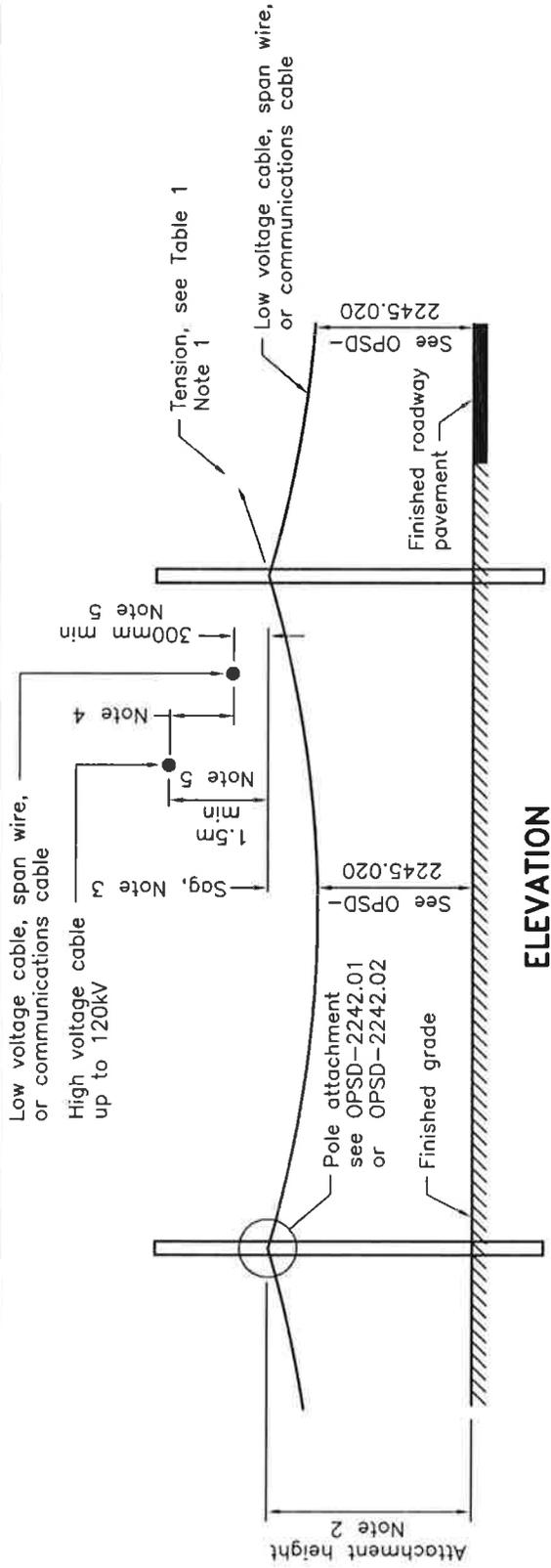
NOTES:

- 1 For number and type of cable, refer to layout drawings and wiring diagrams. For cable arrangement, riser conduit and junction box requirements, refer to OPSD-2240.01, 2540.01, 2552.01, layout or detail drawings.
- 2 Lashing wire to be installed in a one wire spiral lay using a mechanical cable lasher.
- A Pole attachment height shall be at 600mm min from pole top and as high as possible. For minimum attachment heights see OPSD-2245.01
- B Steel messenger cable shall be installed to tension as shown on OPSD-2245.01, size and grade as indicated in the contract.
- C For non-permanent installations of 70m span or shorter, nylon cable ties at 450mm c/c may be used in lieu of lashing wire for cable support.
- D All dimensions are in millimetres or metres unless otherwise shown.



DEAD END ATTACHMENT

ONTARIO PROVINCIAL STANDARD DRAWING	Date	1992 12 15	Rev	1
WOOD POLES WITH AERIAL CABLES LASHED ON MESSENGER	Date _____			
OPSD - 2242.02				



NOTES:

- 1 Cables shall be installed at the tension shown in Table 1 to the sag specified by the cable manufacturer and the Ontario Electrical Safety Code sag tables. Where cables are parallel to an existing cable line on the same poles, the tension shall be adjusted to maintain a consistent vertical spacing.
 - 2 Minimum attachment height to be determined by addition of the clearance height to the maximum sag.
 - 3 Maximum sag shall be based on the heavy loading or thermal loading conditions specified in CSA C22.3, No.1-01. For maximum sag refer to cable manufacturer and the Ontario Electrical Safety Code sag tables.
 - 4 For minimum vertical clearances between the high voltage cables over 120kV and other cables, refer to CSA C22.3, No.1-01.
 - 5 Vertical clearance between wires to be measured with the upper wire in its maximum sag position and the lower wire is assumed to form a straight line between its points of support.
- A All dimensions are in millimetres unless otherwise shown.

TABLE 1

TENSIONS FOR INSTALLATION OF AERIAL CABLES			
Installation Temp. °C	ACSR Tension For Types NS-1, NSF-2 Cables N		
	#2	#1/0	#3/0
-29	1480	1320	1500
-18	1300	1280	1460
0	1120	1210	1410
16	990	1170	1370
32	900	1120	1350
38	860	1070	1330
			7mm Gr.110 9mm Gr.160
			7600
			6950
			5900
			4900
			3900
			3700

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2004

Rev 2



INSTALLATION OF AERIAL CABLE SYSTEMS

OPSD - 2245.01

MINIMUM VERTICAL CLEARANCES

MINIMUM VERTICAL CLEARANCES ABOVE FINISHED GRADE

LOCATION OF WIRES OR CABLES	COMMUNICATIONS CABLE AND SPAN WIRE	LOW VOLTAGE CABLE 0-750V	HIGH VOLTAGE CABLE								
			>750V ≤22kV	>22kV ≤50kV	>50kV ≤90kV	>90kV ≤120kV	>120kV ≤150kV	>150kV ≤200kV	220kV (360kV)	318kV (500kV)	442kV (735kV)
1 OVER FREEWAYS, EXPRESSWAYS, AND RAMPS	6.0	6.0	6.0	6.0	6.1	6.4	6.4	6.9	10.5	15.7	20.7
2 OVER KING'S HIGHWAYS AND OTHER ROADWAYS	4.7	4.7	5.5	5.8	6.1	6.4	6.4	6.9	10.5	15.7	20.7
3 OVER AREAS LIKELY TO BE TRAVELLED BY VEHICLES (OTHER THAN RESIDENTIAL DRIVEWAYS)	4.7	4.7	5.5	5.8	6.1	6.4	6.4	6.9	10.5	15.7	20.7
4 ALONGSIDE ROADS IN DENSELY POPULATED AREAS	4.7	4.7	5.5	5.8	6.1	6.4	6.4	6.9	10.5	15.7	20.7
5 ALONGSIDE ROADS OR OVER AREAS UNLIKELY TO BE TRAVELLED BY VEHICLES	3.3	3.7	4.5	4.9	5.2	5.8	5.8	6.3	6.5	7.5	8.7
6 OVER RESIDENTIAL DRIVEWAYS	4.0	4.0	5.1	5.5	5.8	6.1	6.4	6.9	10.5	15.7	20.7
7 OVER AREAS ACCESSIBLE TO PEDESTRIANS ONLY	2.8	3.4	3.7	4.0	4.3	4.6	4.9	5.4	5.6	6.6	7.8
8 ABOVE TOP OF RAIL AT RAILWAY CROSSINGS	7.6	7.6	7.9	8.4	8.7	9.0	9.3	9.8	10.0	11.0	12.2

NOTES:

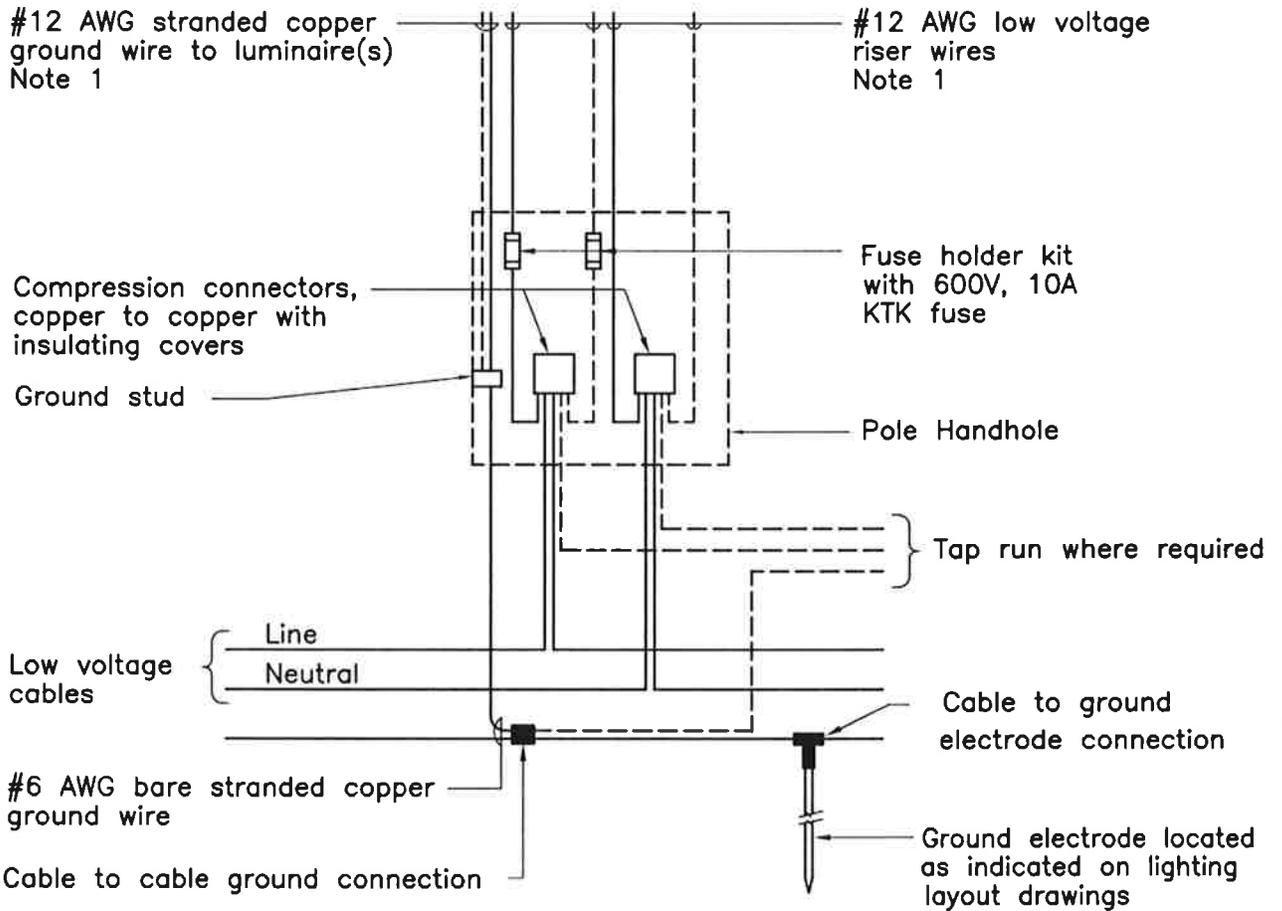
- A Clearances shown are under maximum sag conditions as defined in CSA C22.3, No.1-10.
- B Voltages are rms line to ground. Voltages in brackets are phase to phase.
- C All dimensions are in metres unless otherwise shown.



ONTARIO PROVINCIAL STANDARD DRAWING
 Nov 2011 Rev 1

MINIMUM VERTICAL CLEARANCES FOR AERIAL CABLE SYSTEMS

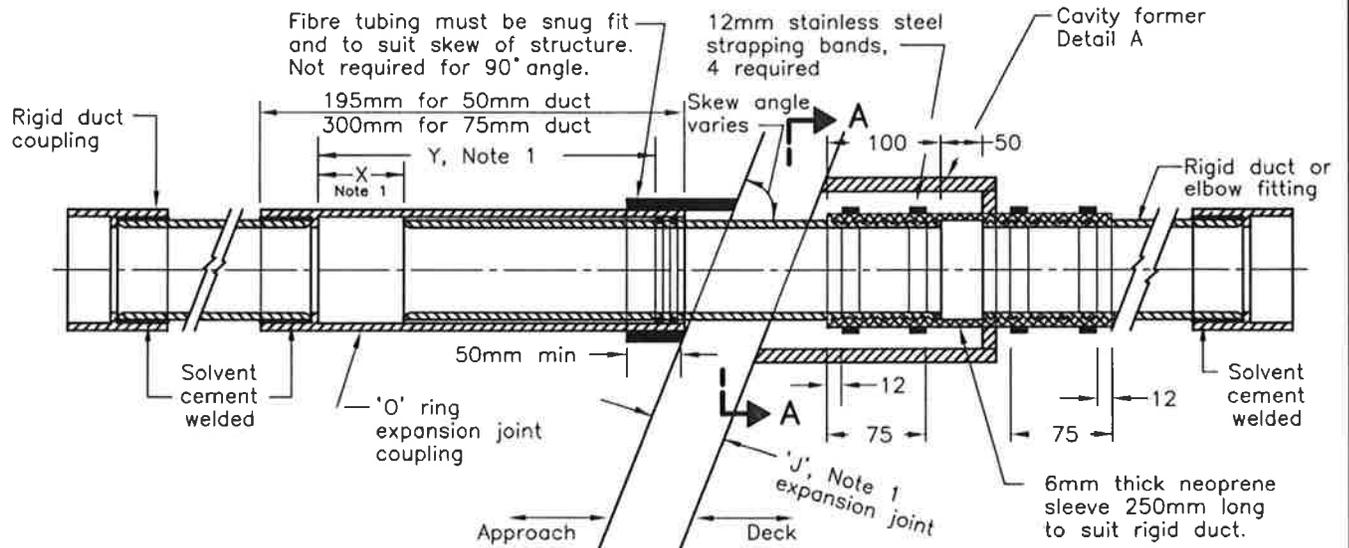
OPSD 2245.020



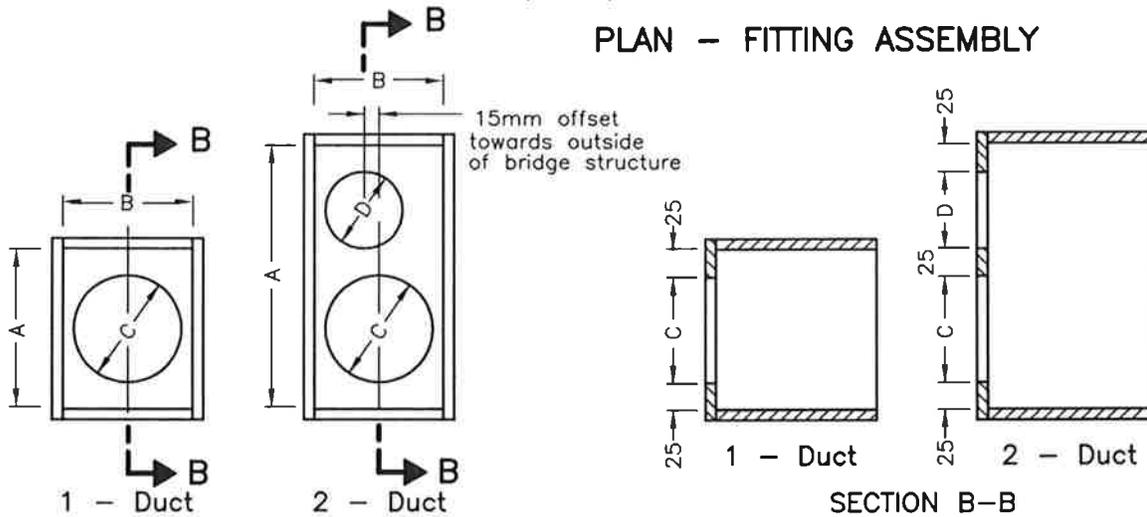
NOTE:

1 Broken lines indicate additional conductors for double luminaire installation.

<p>ONTARIO PROVINCIAL STANDARD DRAWING</p>	<p>1996 09 15 Rev</p>	
<p>POLE WIRING DIAGRAM 120V SYSTEM</p>	<p>Date _____</p>	
	<p>OPSD – 2255.010</p>	

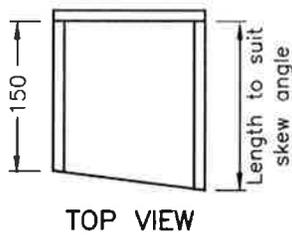


PLAN - FITTING ASSEMBLY



SECTION A-A

SECTION B-B



TOP VIEW

Number and Size of Duct	A	B	C	D
1 - 50mm	120mm	90mm	70mm	-
1 - 75mm	150mm	120mm	100mm	-
2 - 50mm	215mm	90mm	70mm	70mm
1 - 50mm 1 - 75mm	245mm	120mm	100mm	70mm

DETAIL A - CAVITY FORMER

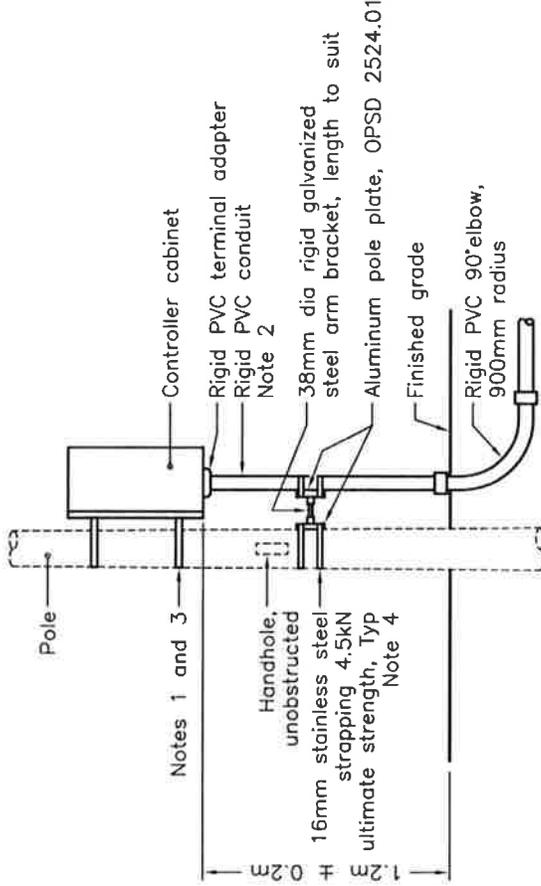
NOTES:

- 1 Refer to structural expansion joint drawings for 'J' dimensions.
 $X = 'J' \text{ at installation temperature} - \text{Min 'J'} + 25, \text{ mm min,}$
 $Y = \text{Max 'J'} - \text{Min 'J'} + 50, \text{ mm min.}$
- A The cavity former shall be made of 10 mm plywood.
- B All dimensions are in millimetres unless otherwise shown.

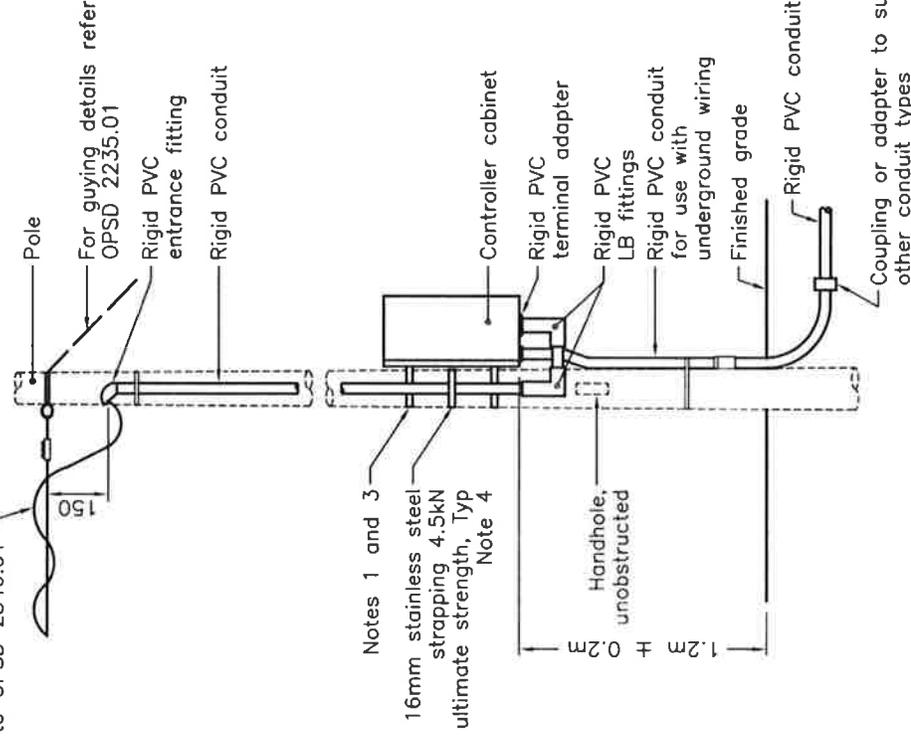
ONTARIO PROVINCIAL STANDARD DRAWING	Date	1991 02 28	Rev	2
EXPANSION AND DEFLECTION FITTING ASSEMBLY	Date _____			
FOR 50mm AND 75mm RIGID DUCTS	OPSD - 2302.02			

For aerial installation refer to OPSD 2540.01

For guying details refer to OPSD 2235.01



UNDERGROUND WIRING INSTALLATIONS



OVERHEAD WIRING INSTALLATIONS

NOTES:

- 1 For controller cabinet bracket mounting details refer to OPSD 2510.020.
- 2 When controller cabinet mounted on metal pole, system ground shall not be connected to pole ground terminal.
- 3 Stainless steel strapping shall not be used as the sole support for electrical equipment installed on wooden poles.
- 4 Spacing shall be as specified in the Ontario Electrical Safety Code or the manufacturer's instructions.

A For location and types of poles and orientation and location of controller cabinet refer to the layout drawings.

B All dimensions are in millimetres unless otherwise shown.

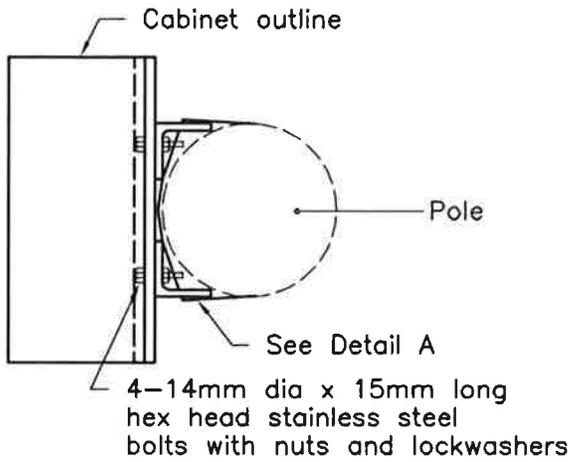
ONTARIO PROVINCIAL STANDARD DRAWING

POLE MOUNTED CONTROLLER CABINET

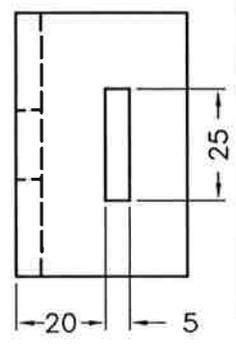
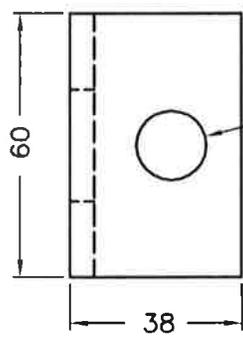
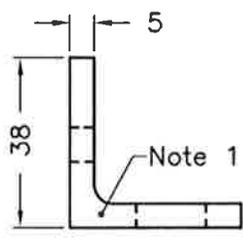
Nov 2012 Rev 0



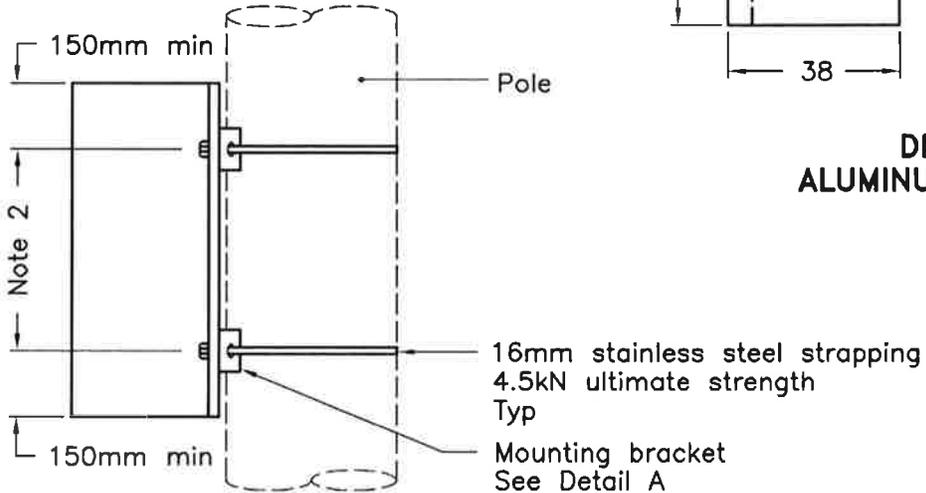
OPSD 2510.010



TOP VIEW



**DETAIL A
ALUMINUM POLE PLATE**

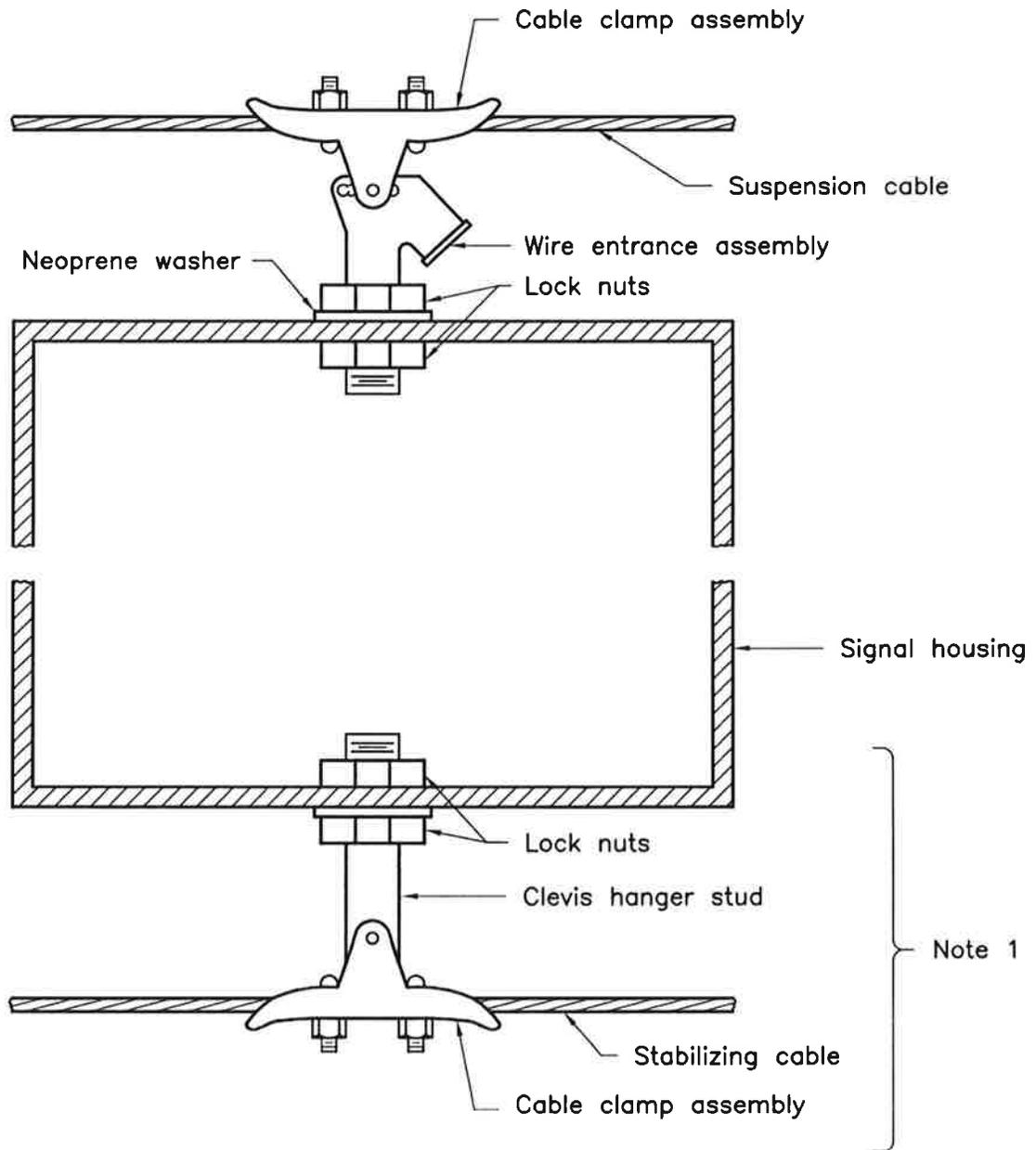


SIDE ELEVATION

NOTES:

- 1 Mounting bracket shall be extruded aluminum grade 6061-T6.
- 2 Adjust mounting location to suit internal cabinet equipment.
- A This OPSD to be read in conjunction with OPSD 2510.010.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev 0	
MOUNTING BRACKET FOR POLE MOUNTED CONTROLLER CABINET	-----		
OPSD 2510.020			

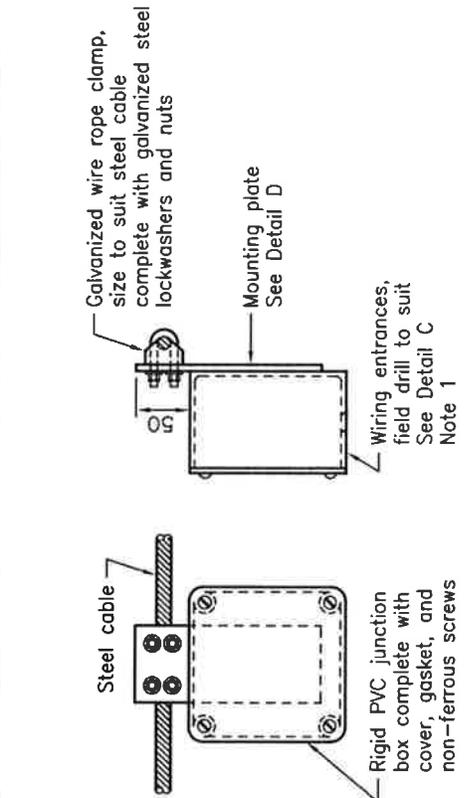


NOTES:

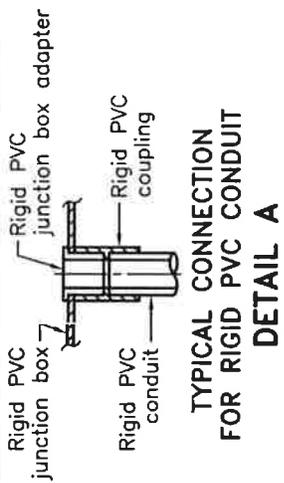
- 1 Lower assembly applies to signal heads only.
- A This standard to be used in conjunction with OPSD-2540.01 and OPSD-2540.02.

ONTARIO PROVINCIAL STANDARD DRAWING	Date	1988 09 26	Rev	2
AERIAL SUSPENSION MOUNTING DETAILS FOR SIGNAL HEADS AND FLASHING BEACONS	Date -----			

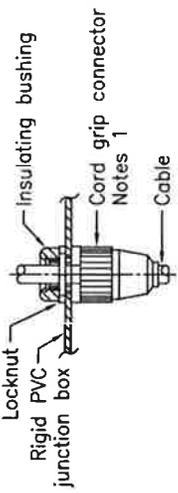
OPSD - 2540.03				



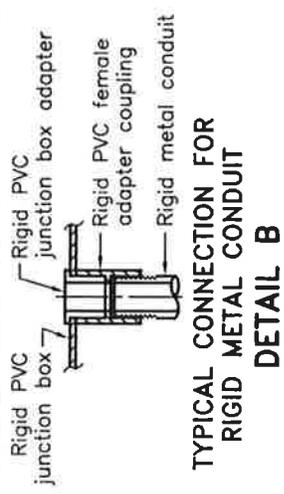
AERIAL SUSPENSION DETAIL



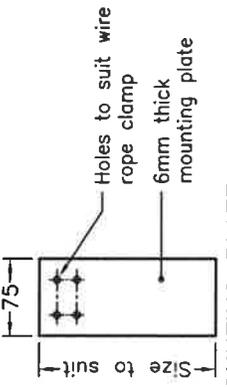
**TYPICAL CONNECTION FOR RIGID PVC CONDUIT
DETAIL A**



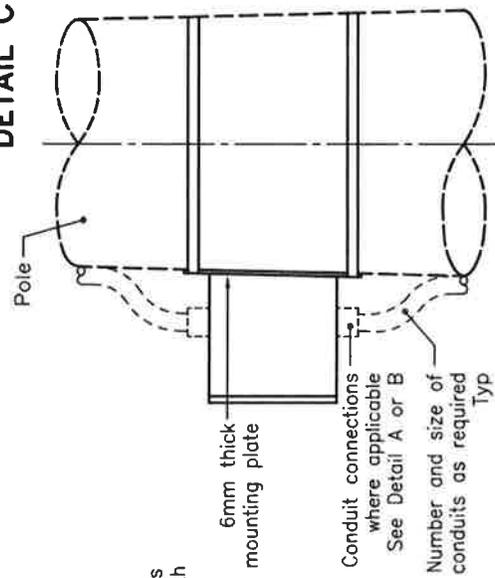
**TYPICAL LIQUID TIGHT STRAIN RELIEF CONNECTOR
DETAIL C**



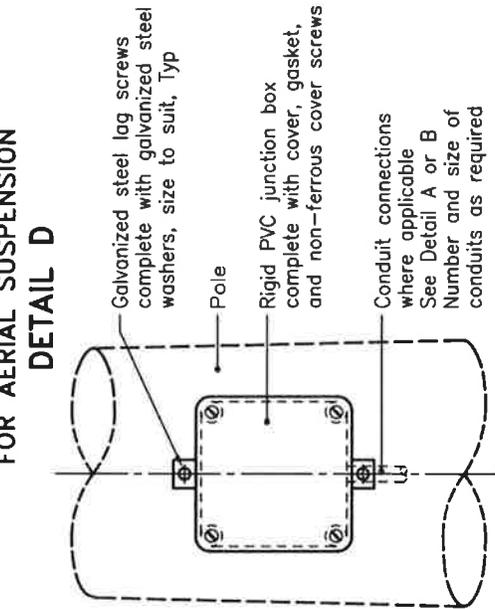
**TYPICAL CONNECTION FOR RIGID METAL CONDUIT
DETAIL B**



**MOUNTING PLATE FOR AERIAL SUSPENSION
DETAIL D**



MOUNTING ON CONCRETE OR METAL POLE



MOUNTING ON WOODEN POLE

NOTES:

- 1 For aerial suspension, drill wiring entrances, number as required, to suit size of cable connector. Wiring entrances shall be located in bottom of junction box only.
- A All dimensions are in millimetres unless otherwise shown.

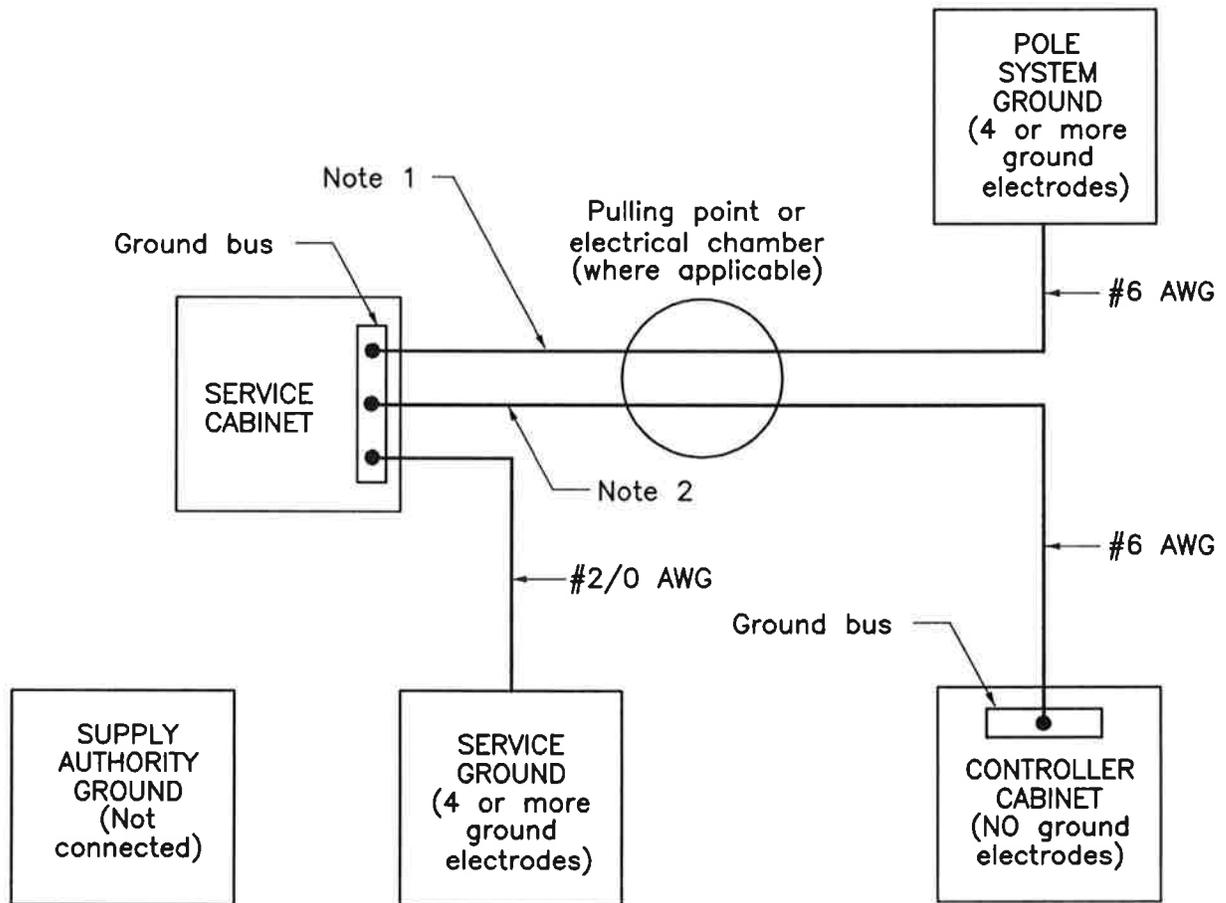
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 1



PVC JUNCTION BOX FOR SIGNAL CABLE SPLICING

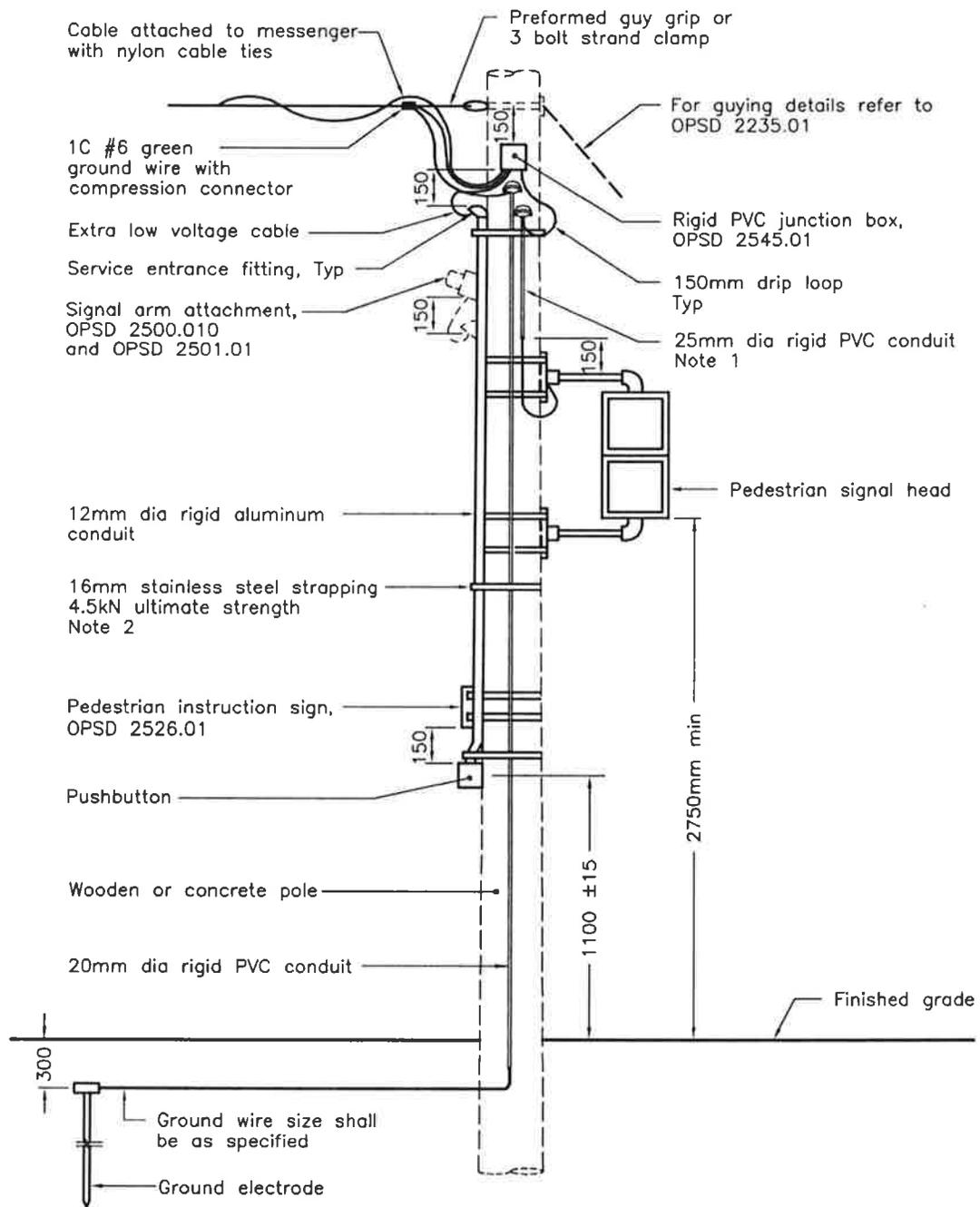
OPSD 2545.01



NOTES:

- 1 The #6 AWG pole (with or without lighting) system ground may connect to the #2/0 grid of the service ground or to the ground bus of the service cabinet.
- 2 The #6 AWG traffic controller cabinet ground shall not be bonded to any ground system except at the ground bus of the service cabinet.

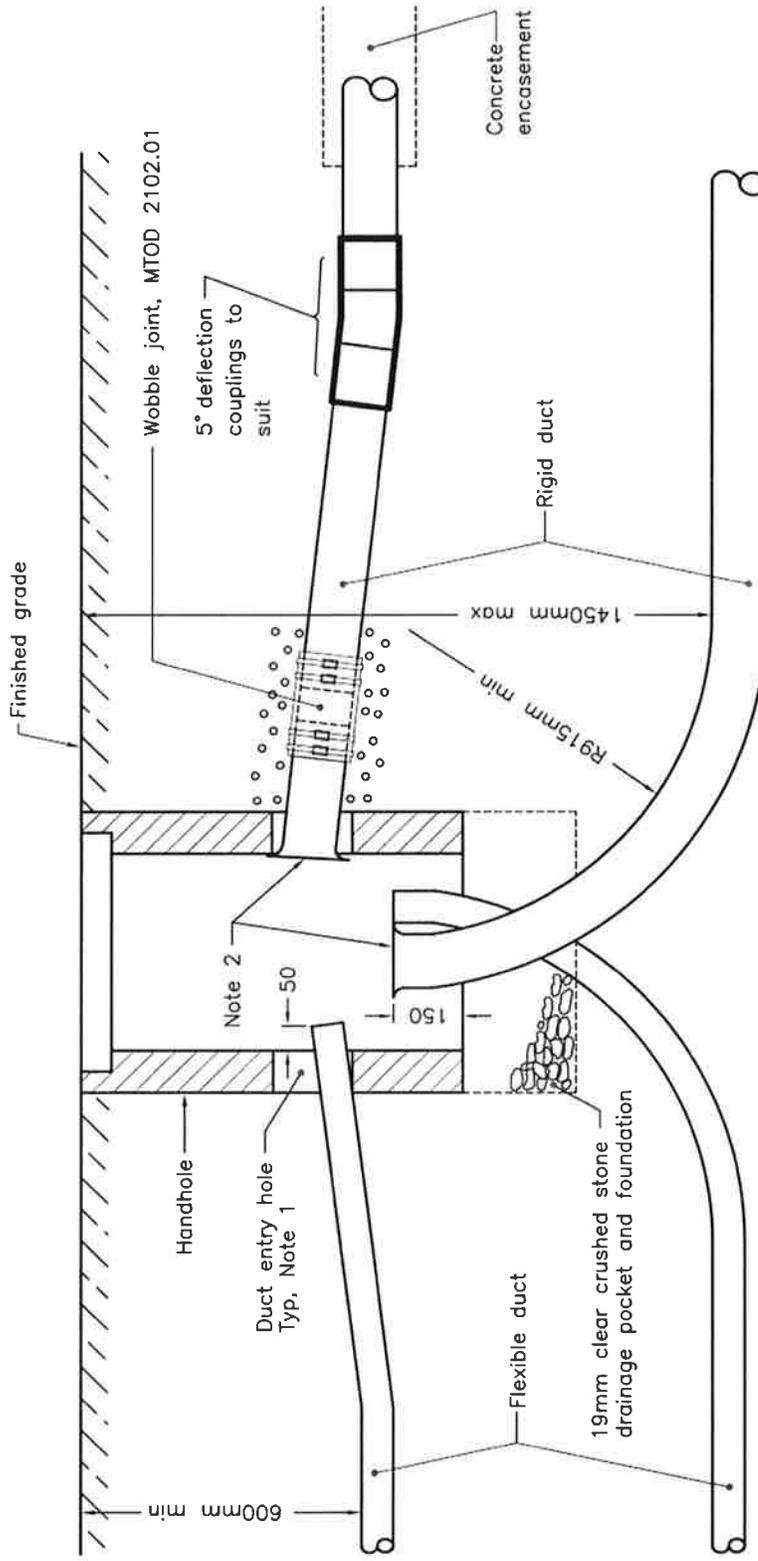
ONTARIO PROVINCIAL STANDARD DRAWING	Date	1989 07 03	Rev
CONTROLLER CABINET GROUNDING SYSTEM	Date -----		
OPSD - 2547.01			



NOTES:

- 1 One 25mm diameter rigid PVC conduit required for each signal head. Install all signal heads prior to installing conduit. Install conduit system to obtain a neat and straight installation.
 - 2 On concrete poles, mount conduits using 16mm stainless steel strapping and buckles. On wooden poles, mount conduits using PVC coated steel or galvanized pipe straps with 6x38mm lag screws.
- A For orientation and location of poles and equipment refer to layout drawings.
 B All dimensions are in millimetres unless otherwise shown.

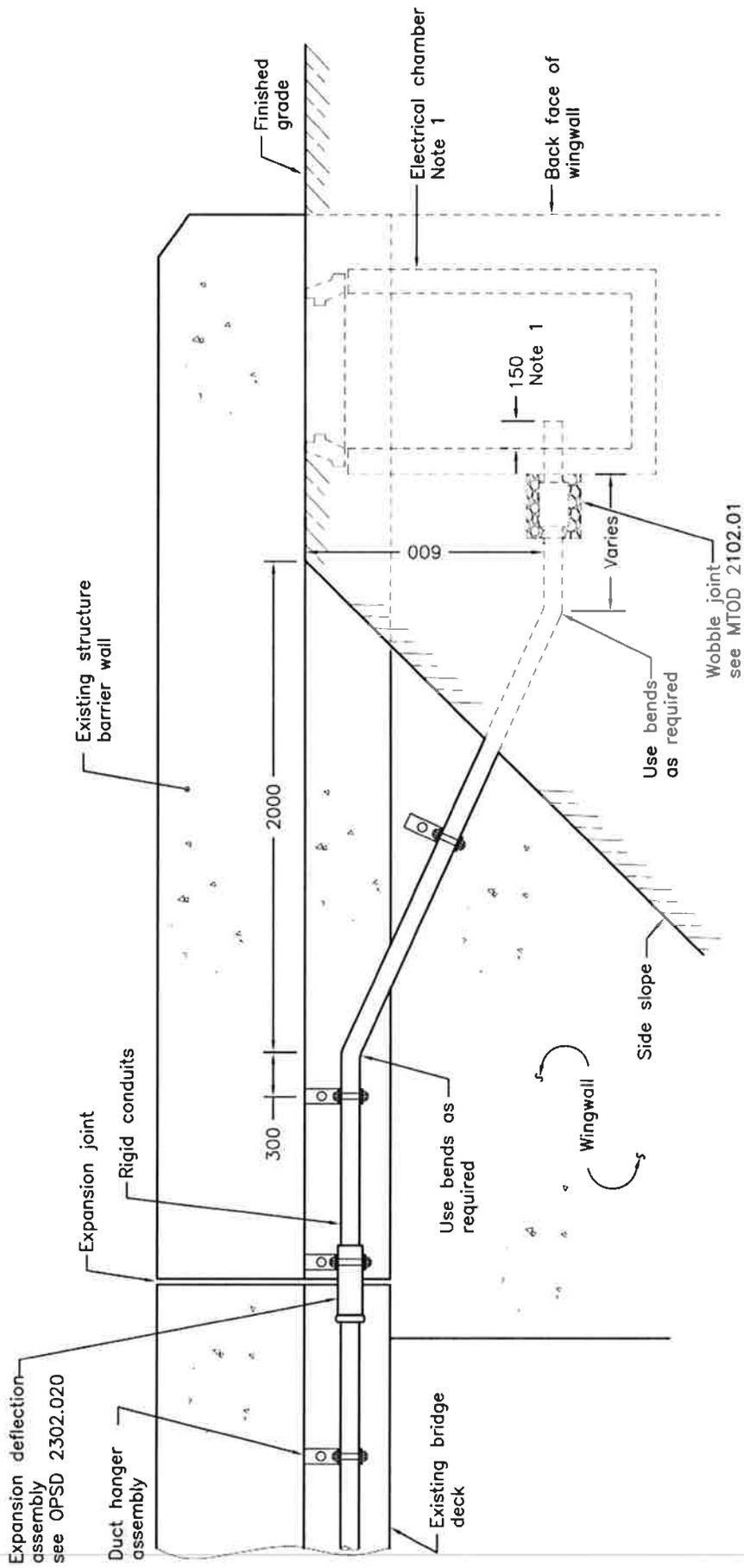
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev 2	
TRAFFIC SIGNAL SYSTEM EQUIPMENT ON WOODEN OR CONCRETE POLES OVERHEAD WIRING INSTALLATION	-----		
OPSD 2552.01			



NOTES:

- 1 Duct entry holes to be filled with expandable foam.
- 2 Rigid ducts terminating in maintenance holes, handholes, or other permanent openings of underground systems shall be provided with an end bell.
- A For installation details see MTOD 2102.01, and OPSD 2117.02.
- B All dimensions are in millimetres unless otherwise shown.

MINISTRY OF TRANSPORTATION ONTARIO DRAWING	October 2008	Rev 0
ELECTRICAL HANDHOLES		
ENTRY OF DIRECT BURIED AND ENCASED DUCTS		
MTOD - 2123.03		



NOTES:

- 1 Supply and installation as specified in the contract.
- A All dimensions are in millimetres unless otherwise shown.

MINISTRY OF TRANSPORTATION ONTARIO DRAWING

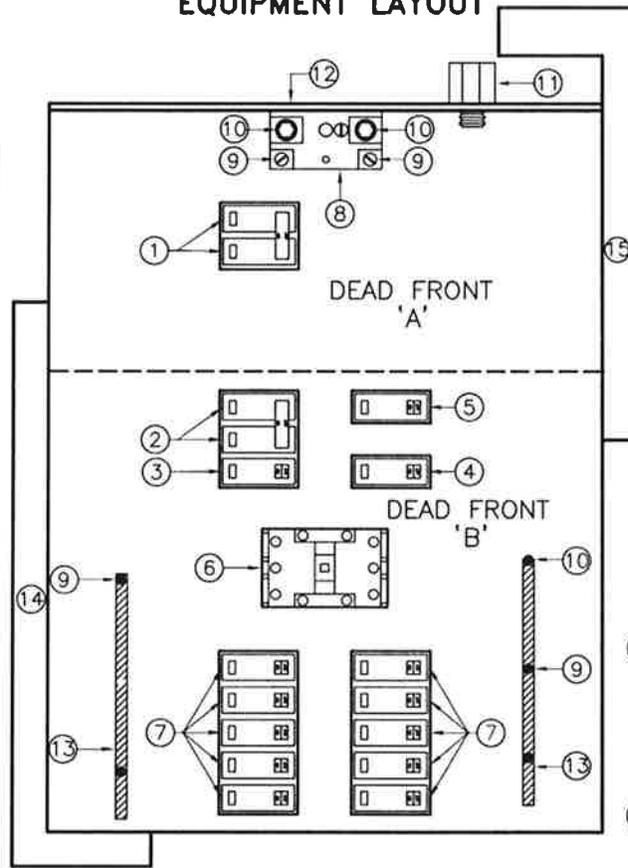
September 2010

Rev

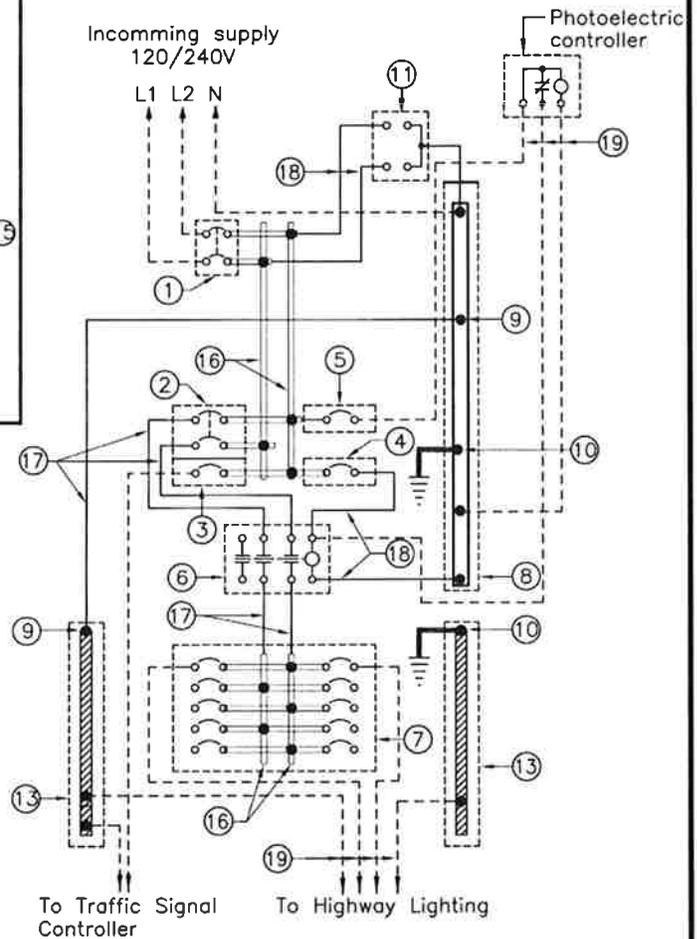
DUCT TRANSITION FROM SURFACE MOUNTED TO DIRECT BURIAL

MTOD - 2302.050

EQUIPMENT LAYOUT



SCHEMATIC WIRING DIAGRAM



ELECTRICAL EQUIPMENT LIST

- | | |
|---|---|
| ① Main circuit breaker – 240V, 100A, 2–pole. | ⑩ Ground lug for No.2/0 AWG stranded copper ground wire. |
| ② Lighting circuit breaker – 240V, 60A, 2–pole. | ⑪ Secondary lightning arrester, 650V, 2–pole. |
| ③ Traffic signal circuit breaker – 240V, 1–pole.
(ampacity as indicated elsewhere in the contract). | ⑫ Drip shield. |
| ④ Circuit breaker used for relamping – 240V, 15A, 1–pole. | ⑬ Secondary neutral and ground bus according to CSA and project requirements. |
| ⑤ Circuit breaker for photoelectric controller – 240V, 15A, 1–pole. | ⑭ Primary barrier. |
| ⑥ Lighting contactor – 240V, 60A, 3–pole, 120V coil. | ⑮ Secondary barrier. |
| ⑦ Branch circuit breakers – 240V, 30A, 1–pole
(number of breakers as indicated elsewhere in the contract). | ⑯ Copper bus bar |
| ⑧ Solid neutral assembly – 100A minimum | ⑰ No.6 AWG RWU90 wire. |
| ⑨ Ground lug for No.6 AWG stranded copper ground wire. | ⑱ No.12 AWG RWU90 wire. |
| | ⑲ Field wiring |

NOTE:

A This standard to be read in conjunction with OPSDs 2440.050 2440.060 and MTOD 2440.030.

MINISTRY OF TRANSPORTATION ONTARIO DRAWING

February 2005

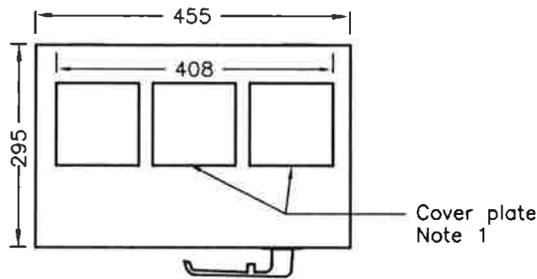
Rev

3

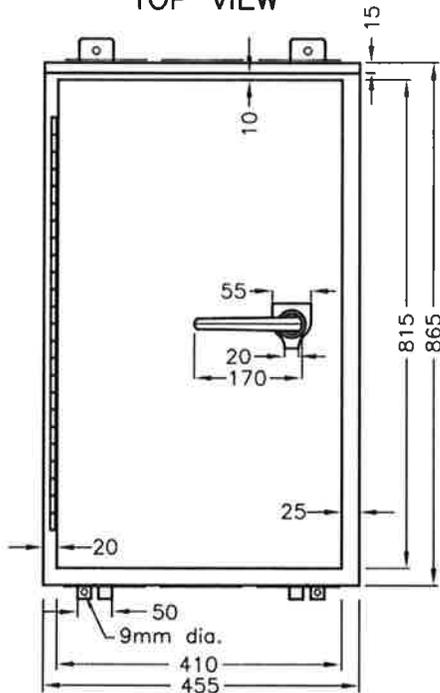
SUPPLY CONTROL CABINET ASSEMBLY TYPE 1

120/240V, 100A, 1–PHASE, 3–WIRE

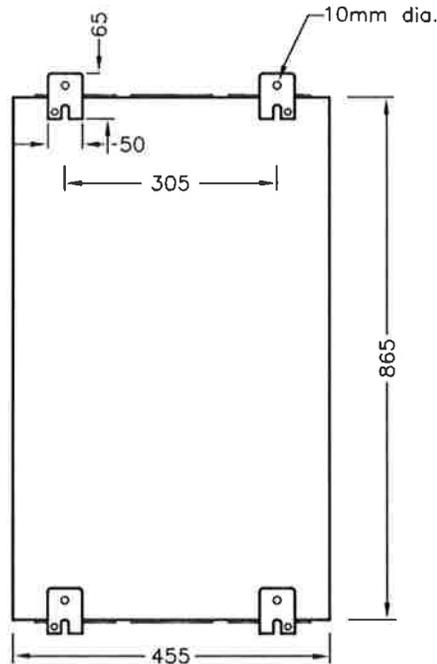
MTOD – 2440.010



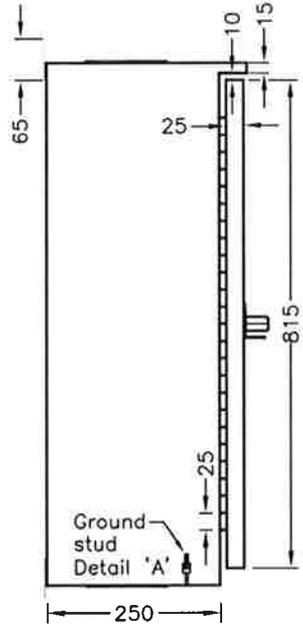
TOP VIEW



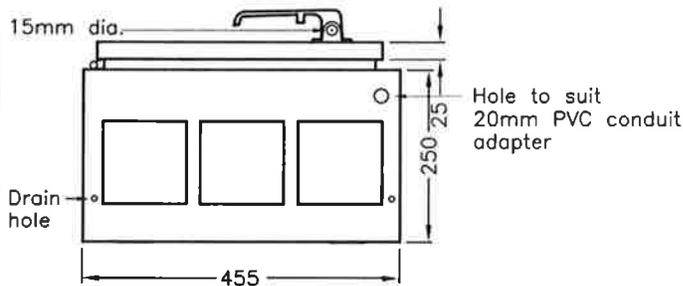
FRONT VIEW



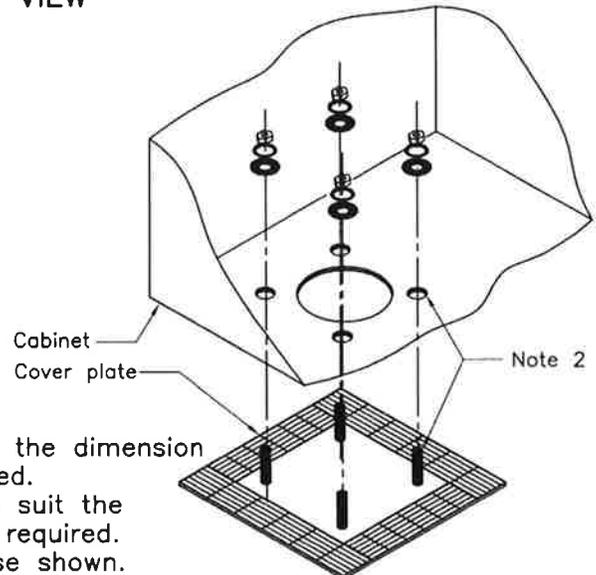
BACK VIEW



SIDE VIEW



BOTTOM VIEW



COVER PLATE DETAIL

NOTES:

- 1 All plates shall be the same size and shall suit the dimension and quantity of the PVC conduit adapter required.
- 2 Bolt and hole pattern for top and bottom - to suit the dimension of the PVC conduit terminal adapter required.
- A All dimensions are in millimetres unless otherwise shown.

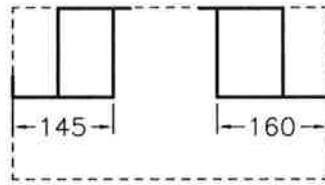
MINISTRY OF TRANSPORTATION ONTARIO DRAWING

October 2008

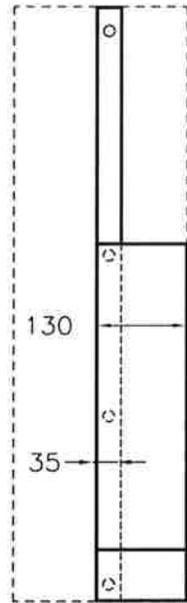
Rev 1

**SUPPLY CONTROL CABINET
ASSEMBLY TYPE 1 AND 2
ENCLOSURE**

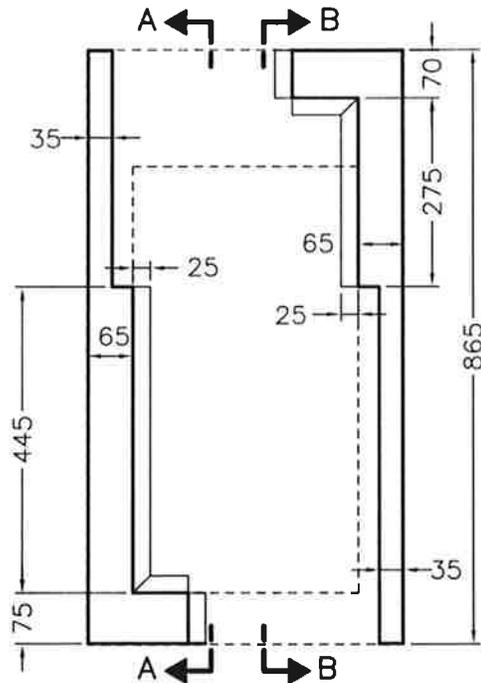
MTOD - 2440.030



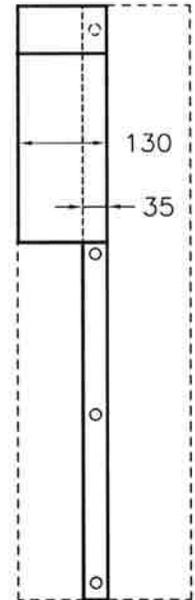
TOP VIEW



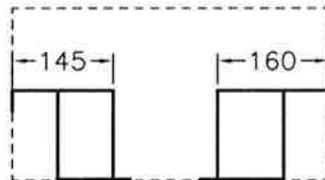
SECTION A-A



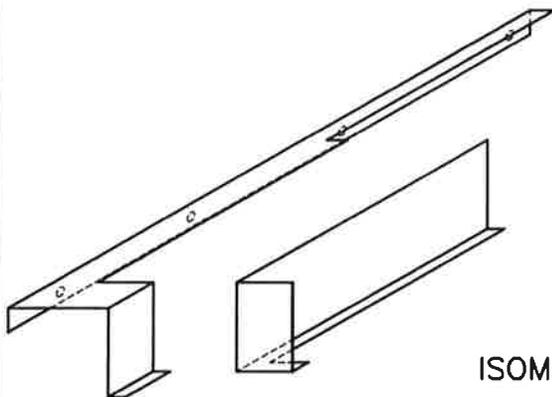
FRONT VIEW



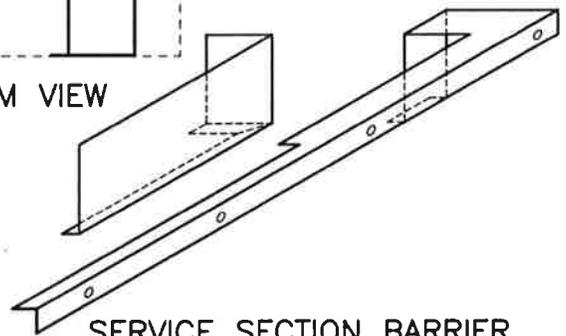
SECTION B-B



BOTTOM VIEW



BRANCH CIRCUIT SECTION BARRIER



SERVICE SECTION BARRIER

ISOMETRIC VIEW

NOTES:

- A All dimensions are shown for guidance only. Dimensions shall be modified as necessary to meet the requirements of the Ontario Electrical Safety Code.
- B All dimensions are in millimetres unless otherwise shown.

MINISTRY OF TRANSPORTATION ONTARIO DRAWING

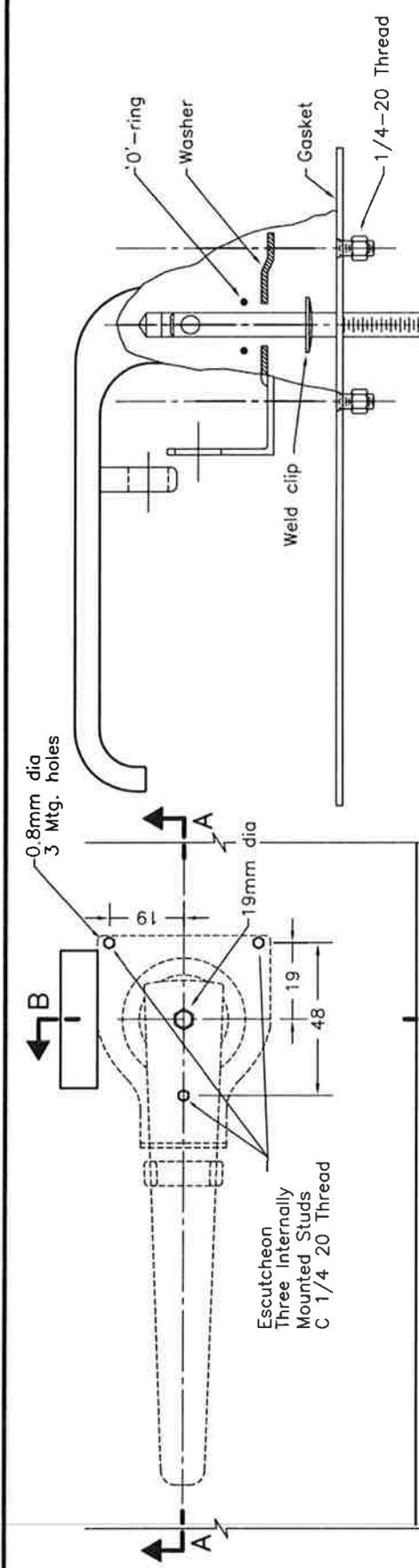
February 2004

Rev 0

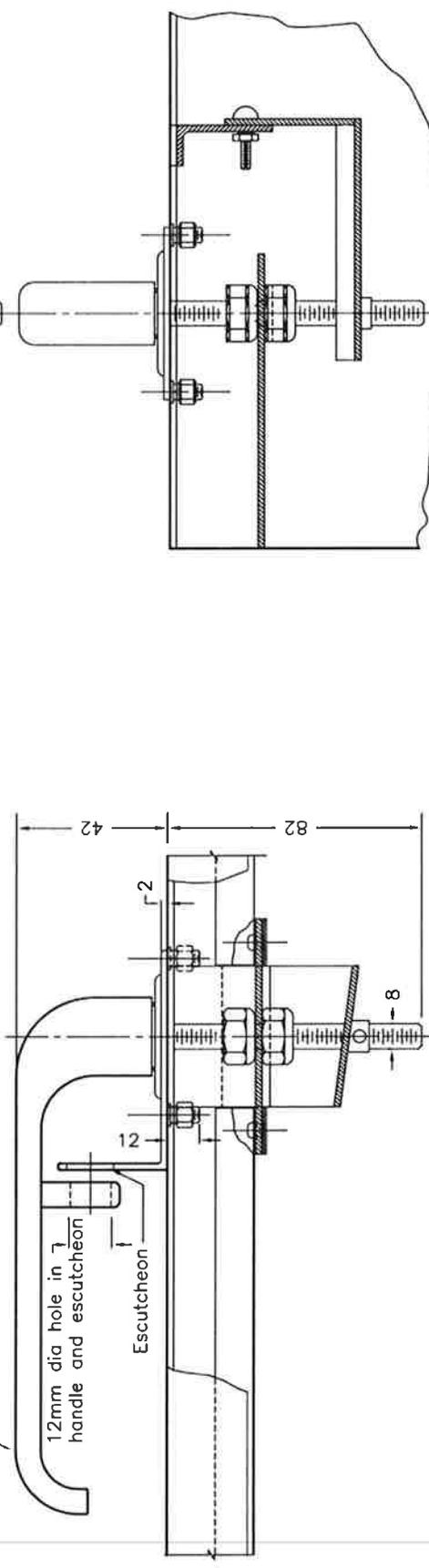
**SUPPLY CONTROL CABINET
ASSEMBLY TYPE 1 AND 2**

BARRIER DETAILS

MTOD - 2440.051



PLAN



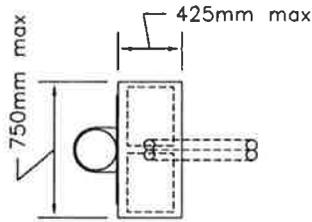
SECTION A-A

SECTION B-B

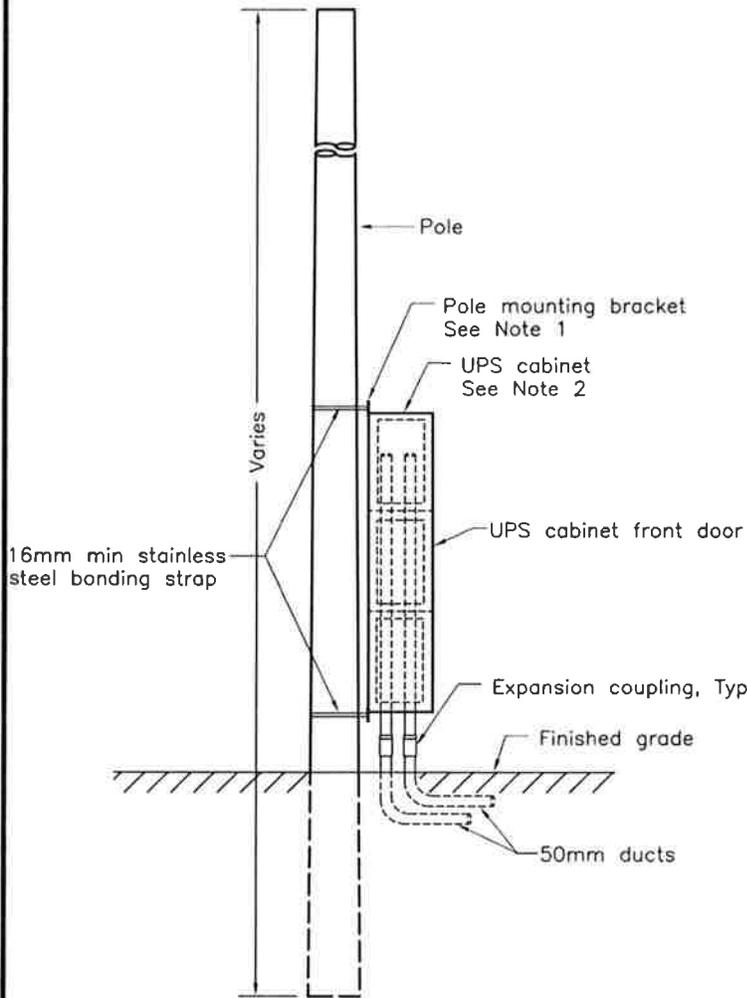
NOTES:

- A Handle shall be stainless steel with threaded shank, blind mount escutcheon and o-ring and gasket.
- B All dimensions are in millimetres unless otherwise shown.

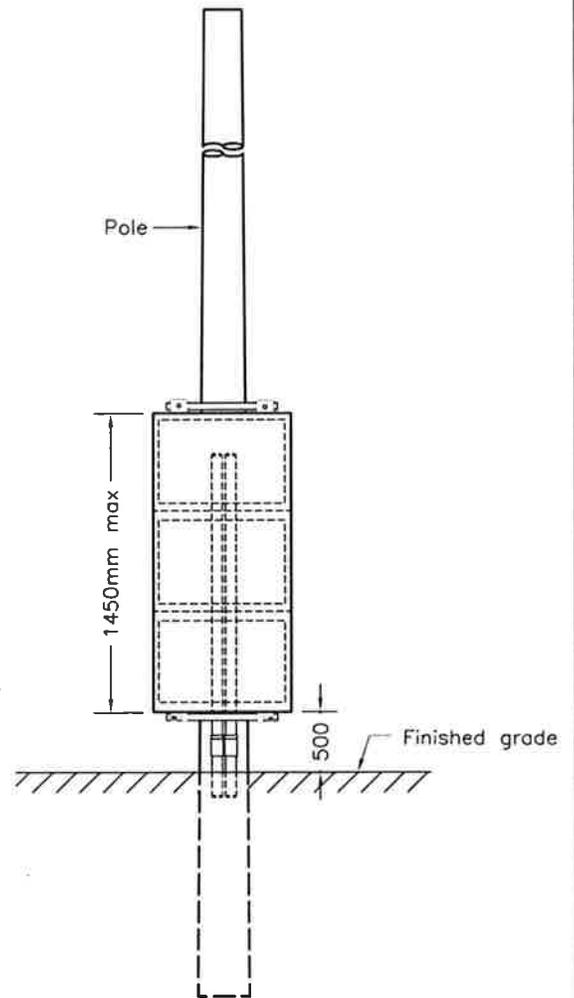
MINISTRY OF TRANSPORTATION ONTARIO DRAWING	February 2004	Rev 0
SUPPLY CONTROL CABINET		
ASSEMBLY TYPE 1, 2 AND 3		
3 POINT STAINLESS STEEL DOOR HANDLE		
MTOD - 2440.061		



TOP VIEW



SIDE VIEW

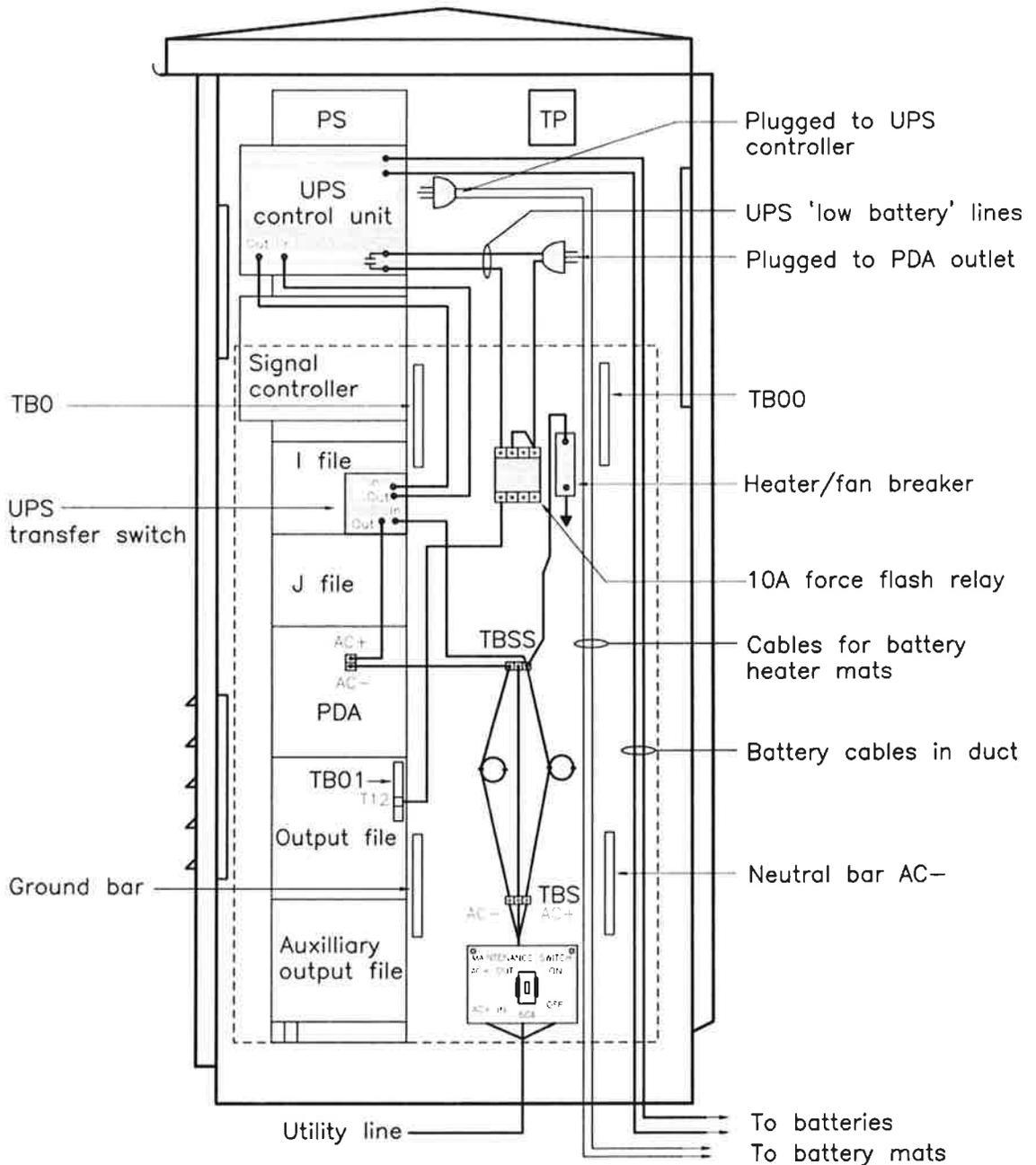


FRONT VIEW

NOTES:

- 1 For mounting bracket detail refer to MTOD 2440.040.
- 2 UPS cabinet complete with batteries and heating pads, number of shelves varies.
- A For numbers, sizes and orientation of ducts, refer to contract drawings.
- B For location and orientation of cabinet refer to contract drawings.
- C For UPS cabinet monitoring details refer to contract documents.
- D All dimensions are in millimetres unless otherwise shown.

MINISTRY OF TRANSPORTATION ONTARIO DRAWING	November 2007	Rev 0
UNINTERRUPTIBLE POWER SUPPLY (UPS) CABINET POLE MOUNTED	----- -----	
	MTOD 2510.011	



NOTES:

A Shaded areas indicates additional equipment for the UPS system.
 B UPS—uninterruptible power supply.

MINISTRY OF TRANSPORTATION ONTARIO DRAWING

November 2007

Rev 0

**TRAFFIC SIGNAL CABINET
 MODIFICATIONS TO ACCOMMODATE
 UPS CONTROL UNIT AND UPS SYSTEM**

MTOD 2528.020

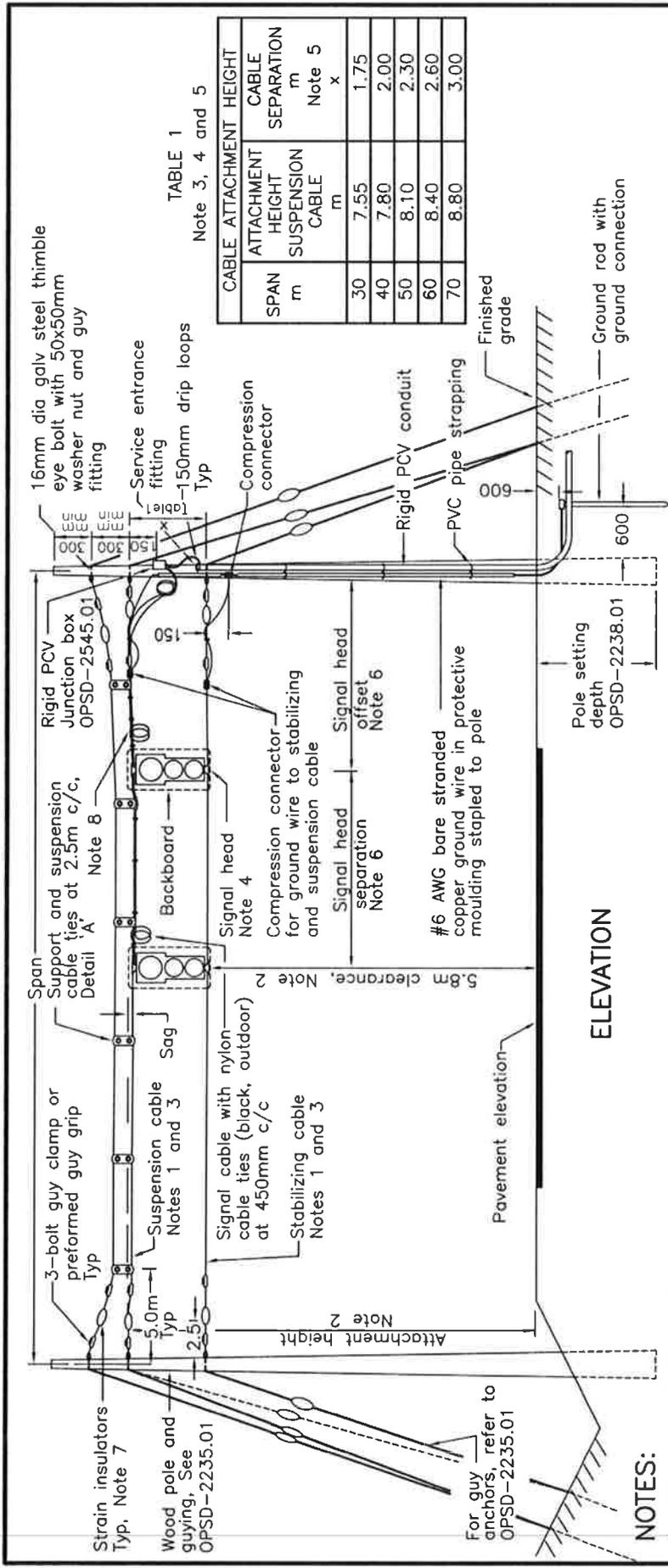


TABLE 1
Note 3, 4 and 5

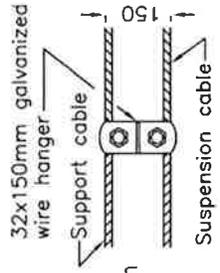
SPAN m	CABLE ATTACHMENT HEIGHT	
	ATTACHMENT HEIGHT SUSPENSION CABLE m	CABLE SEPARATION m Note 5 x
30	7.55	1.75
40	7.80	2.00
50	8.10	2.30
60	8.40	2.60
70	8.80	3.00

ELEVATION

- NOTES:
- Steel messenger cables shall be:
 - a - Support cable (required only on spans greater than 60m) - 9mm dia Grade 160
 - b - Suspension cable - 9mm dia Grade 160
 - c - Stabilizing cable - 7mm dia Grade 110

- Attachment height is to be set to obtain the clearance height shown under CSA heavy loading conditions. Install suspension cable attachment height according to Table 1 and allow for deviations between pavement elevation and finished grade elevation at pole. Install stabilizing cable at cable separation height according to Table 1.
- Cable to be installed using the tension corresponding to the installation temperature as shown in OPSD-2245.01.
- Details shown are for 'Highway' type signal heads. For larger signal heads increase the cable separation and suspension cable attachment height accordingly.
- Values shown in table to be interpolated to obtain intermediate values.
- For orientation and location of signal heads and poles, refer to layout drawings.
- Strain insulators to be used only for attachment to utility poles or poles with live cables installed above the suspension cable.
- Where required, provide sufficient length of cable coils to allow signal head movement to suit construction stages.

A All dimensions are in millimetres unless otherwise shown.



Detail 'A'

MINISTRY OF TRANSPORTATION ONTARIO DRAWING March 2001 Rev 1

AERIAL TRAFFIC SIGNAL INSTALLATION

MTOD - 2540.01