STANDARD GROUNDING

DRAWING NUMBER	SHT.	DRAWING TITLE	DWG REV.	BOM REV.
A-33-00	**1**	**GENERAL INFORMATION**	**C**	**-**
A-33-01	**1 – 2**	**GROUND GRID TYPES A, B, & C**	**C**	**C**
A-33-02	**1 – 3**	**GROUND GRID TYPES D, E, F, & N**	**F / B**	**E**
A-33-04	**1**	**SUPPLEMENTARY GROUNDING**	**A**	**-**
A-33-05	**1**	**GROUND WIRE INSTALLATION**	**0**	**-**
A-33-06	**1**	**GROUND GRID WIRE SIZE AND OHMIC VALUE**	**F**	**-**
A-33-07	**1**	**USE OF TYPE "A" GRID IN URBAN DISTRIBUTION**	**0**	**-**
A-33-08	**1**	**USE OF TYPES "C" & "D" GRIDS IN URBAN DISTRIBUTION**	**0**	**-**

*Sask**Power*** - DISTRIBUTION STANDARDS

APPROVAL	DESIGN CHK	DRN. **DCD**	**INDEX**
L. MOEN	**D. DONAIS**	CHKD.	
		2018-06-05	

DATE OF ISSUE: 2018-06-07 | DRAWING NO: **A-33-INDEX** | **SHEET 1 of 1** | REV. **M**

GROUNDING

1. **GROUND WIRE MOULDING (WHEN REQUIRED)**

   1.1 **GROUND WIRE MOULDING SHALL EXTEND 150mm BELOW FINISHED GRADE.**

   1.2 **GROUND WIRE MOULDING IN BOTH RURAL AND URBAN AREAS SHALL BE INSTALLED AS TO FULLY COVER GROUND WIRE ATTACHED TO POLE.**

   1.3 **DO NOT INSTALL GROUND WIRE MOULDING WHERE A CABLE GUARD IS ALSO REQUIRED. INSTALL THE GROUND WIRE UNDER THE CABLE GUARD AND DELETE THE MOULDING AND MOULDING STAPLES.**

2. **GROUND WIRES SHALL BE INSTALLED ON THE POLE OPPOSITE SIDE TO THE CLIMBING SIDE. FRAMING DRAWINGS MAY NOT INDICATE THIS CLEARLY DUE TO THE DIFFICULTY OF SHOWING WIRE CONNECTIONS AND CORRECT LOCATION ON THE POLE IN THE SAME DRAWING.**

3. **ALL GROUND GRIDS, SINGLE AND MULTI-ROD, SHALL HAVE RESISTANCE MEASUREMENTS TAKEN AT THE TIME OF INSTALLATION OR ALTERATION. THE MAXIMUM ALLOWABLE VALUES FOR DIFFERENT INSTALLATIONS ARE INDICATED ON DRAWING A-33-06 SHEET 1 OF 1.**

4. **FOR COSTING PURPOSES, GROUND GRID WIRE IS SHOWN AS BEING SEPARATE FROM ABOVE GRADE GROUND WIRE. IT IS ACTUALLY A CONTINUOUS LOOP.**

5. **WHERE CURRENT FLOWS IN THE GROUND WIRE DURING NORMAL APPARATUS OPERATION, TWO PATHS TO GROUND SHALL BE INSTALLED.**

6. **IN ORDER TO OBTAIN THE REQUIRED GROUND GRID OHMIC VALUES, REGARDLESS OF GROUND GRID TYPE, ADDITIONAL REMOTE RODS MAY HAVE TO BE DRIVEN. REFER TO DRAWING A-33-04 SHEET 1 OF 1 FOR DETAILS.**

7. **WHERE IT IS SUSPECTED THAT THE SOIL MAY NOT PROVIDE GOOD GROUNDING, THE GROUND RODS SHOULD BE SECTIONAL TYPE TO ALLOW FOR ADDITIONAL RODS TO BE DRIVEN. A MINIMUM OF TWO SECTIONAL RODS SHALL BE USED IN ALL SITUATIONS.**
   SECTIONAL ROD CODE: 26022 COUPLING ROD CODE: 21002

8. **THERE ARE TWO TYPES OF GROUNDING CLAMPS AVAILABLE. HEX BOLT CLAMPS, CODE 20252, SHOULD BE USED ON ALL SINGLE ROD INSTALLATIONS. U-BOLT CLAMPS, CODE 20248, SHOULD BE USED ON ALL MULTI ROD GRIDS.**

9. **WITH THE EXCEPTION OF THE TYPE A GRID, ALL THE GROUND GRIDS IN THE A-33 SECTION WILL ALLOW FOR A MAXIMUM LINE TO GROUND FAULT CURRENT OF 8100 AMPS (FOR #2 BARE COPPER) AND 5100 AMPS (FOR #4 BARE COPPER), WHEN THESE ARE CLEARED IN 0.5 SECONDS OR LESS. THESE LIMITS ARE BASED OFF OF THE DAMAGE CURVES FOR BARE COPPER WIRE AND A BOLTED CONNECTION. THE STEP AND TOUCH POTENTIAL WILL BE SAFE AT THESE FAULT CURRENT LIMITS IF WE ASSUME THE GRIDS ARE ONLY TO PROTECT A WORKER WEIGHING 70KG OR MORE, WHO IS WEARING RUBBER SOLED SAFETY BOOTS, AND OPERATING EQUIPMENT EITHER WITH A HOT STICK OR RUBBER GLOVES. THESE VALUES DO NOT TAKE THE GENERAL PUBLIC INTO CONSIDERATION.**

10. **TYPE A GRID IS INTENDED FOR EQUIPMENT GROUNDING ONLY AND IS NOT INTENDED TO PROTECT THE PUBLIC OR WORKERS IN A FAULT CURRENT SITUATION.**

BILL OF MATERIAL

ITEM NO.	CODE NO.	QUANTITY A	QUANTITY B	QUANTITY C	DESCRIPTION
1	**2 02 48**	**-**	**4**	**4**	**CLAMP - GROUND ROD - 3/4"- CU - U-BOLT**
1	**2 02 52**	**1**	**-**	**-**	**CLAMP - GROUND ROD - 3/4"- CU - HEX BOLT**
2	**2 10 02**	**1**	**3**	**3**	**COUPLING-SEC. GRD ROD-COPPER BONDED**
3	**2 60 22**	**2**	**6**	**6**	**GRD ROD SEC. COPPER BONDED 3/4"X10'**
4	**2 83 02**	**-**	**-**	**-**	**WIRE-COPPER-#2/7 STR (SEE NOTE 1)**
4	**2 83 04**	**-**	**7 m**	**11 m**	**WIRE-COPPER-#4/7 STR**

NOTE:

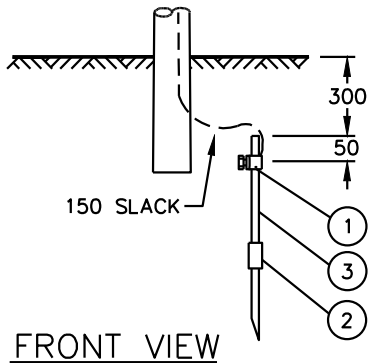
1. **USE #2 CU WIRE INSTEAD OF #4 CU WIRE WHEN INSTALLING TYPE C GRID FOR A GOPT SWITCH STRUCTURE.**

*Sask***Power** - DISTRIBUTION STANDARDS

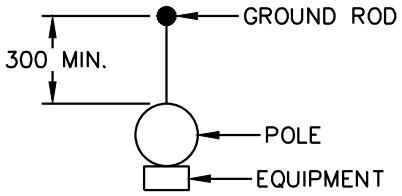
APPROVAL	DESIGN CHK	DRN. **ARU**	**GROUND GRID TYPES A, B, AND C**
L. MOEN	**A. UHREN**	CHKD.	
		2016-05-26	

DATE OF ISSUE: 2016/07/26 | DRAWING NO. **A-33-01** | **SHEET 1 OF 2** | REV. **C**

SPC/AUTODRAFT

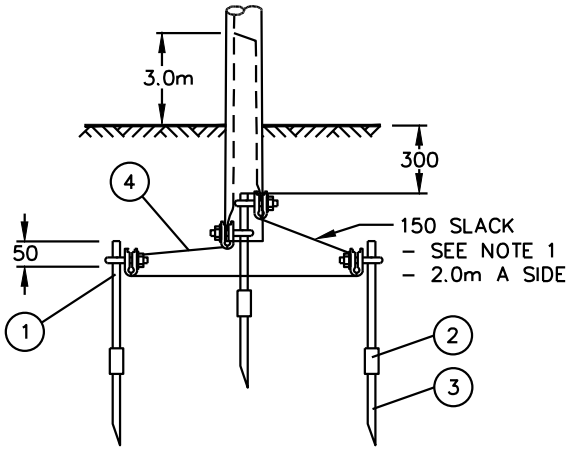


FRONT VIEW

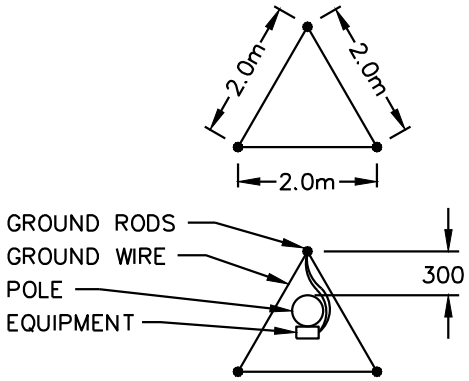


PLAN VIEW

TYPE 'A' GROUND GRID

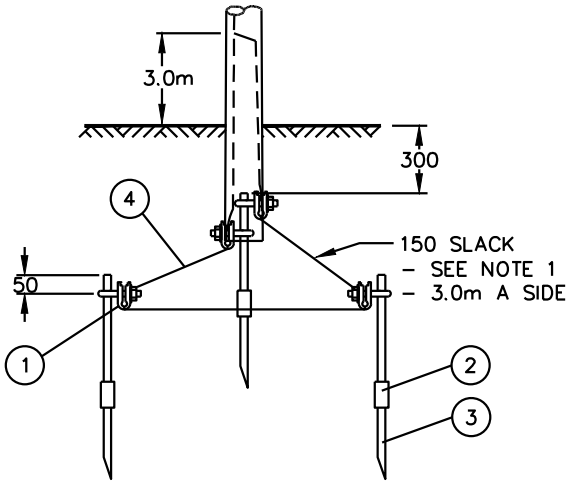


FRONT VIEW

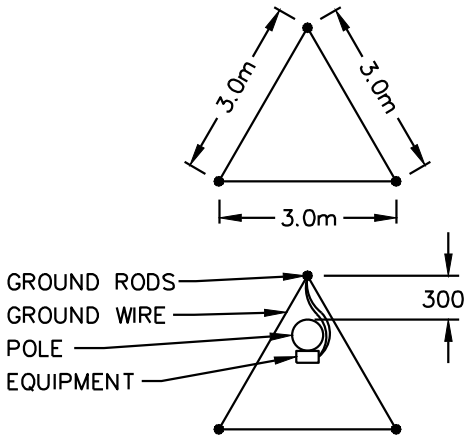


PLAN VIEW

TYPE 'B' GROUND GRID



FRONT VIEW



PLAN VIEW

TYPE 'C' GROUND GRID

NOTE:

1. GROUNDING CONDUCTOR TO FORM A CONTINUOUS LOOP FROM ABOVE GRADE DOWN AROUND THE GROUND GRID AND BACK ABOVE GRADE.

SCALE: N.T.S. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED

SaskPower – DISTRIBUTION STANDARDS			
APPROVAL L.MOEN	DESIGN CHK. A.UHREN	DRN. D.REDEKOPP CHKD. D.REID	GROUND GRID TYPES A, B & C
		2015-11-17	
DATE OF ISSUE 2016/02/05		DRAWING NO. A-33-01	SHEET 2 of 2 REV. C

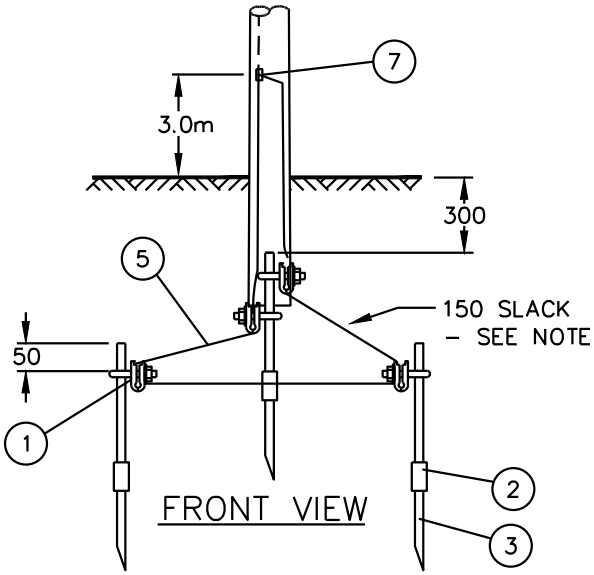
BILL OF MATERIAL

ITEM NO.	CODE NO.	QUANTITY D	QUANTITY E	QUANTITY F	QUANTITY N	DESCRIPTION
1	**2 02 48**	**4**	**6**	**3**	**8**	**CLAMP - GROUND ROD - 3/4"- CU - U-BOLT**
2	**2 10 02**	**3**	**4**	**2**	**6**	**COUPLING-SEC. GRD ROD-COPPER BONDED**
3	**2 60 22**	**6**	**8**	**4**	**12**	**GRD ROD SEC. COPPER BONDED 3/4"X10'**
4	**2 83 02**	**-**	**39 m**	**10 m**	**22 m**	**WIRE - CU #2/7 STR**
5	**2 83 04**	**18 m**	**-**	**-**	**-**	**WIRE - CU #4/7 STR**
6	**5 12 01**	**-**	**2**	**1**	**2**	**CONNECTOR –COPPER - 2C2 CRIMPIT**
7	**5 12 06**	**1**	**-**	**-**	**-**	**CONNECTOR –COPPER - 4C4 CRIMPIT**

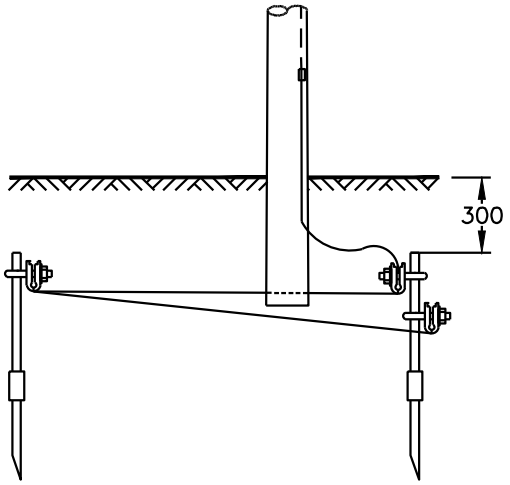
*Sask**Power*** **-** DISTRIBUTION STANDARDS

APPROVAL	DESIGN CHK	DRN. **ARU**	**GROUND GRID TYPES D, E, F & N**
L. MOEN	**A. UHREN**	CHKD.	
		2015-10-29	

DATE OF ISSUE: 2016/02/05 | DRAWING NO. **A-33-02** | **SHEET 1 OF 3** | REV. **E**

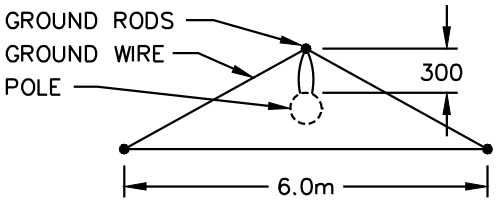


FRONT VIEW



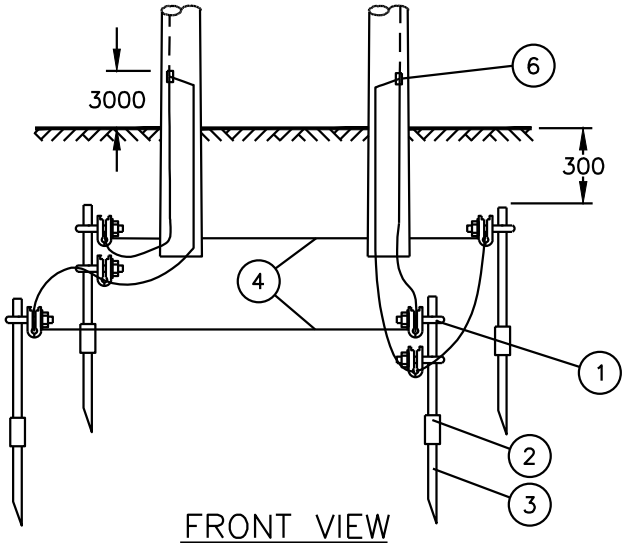
SIDE VIEW

NOTE: MUST BE PLACED WITHIN LANE OR EASEMENT.

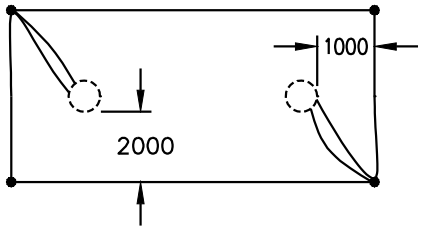


PLAN VIEW

TYPE 'D' GROUND GRID



FRONT VIEW

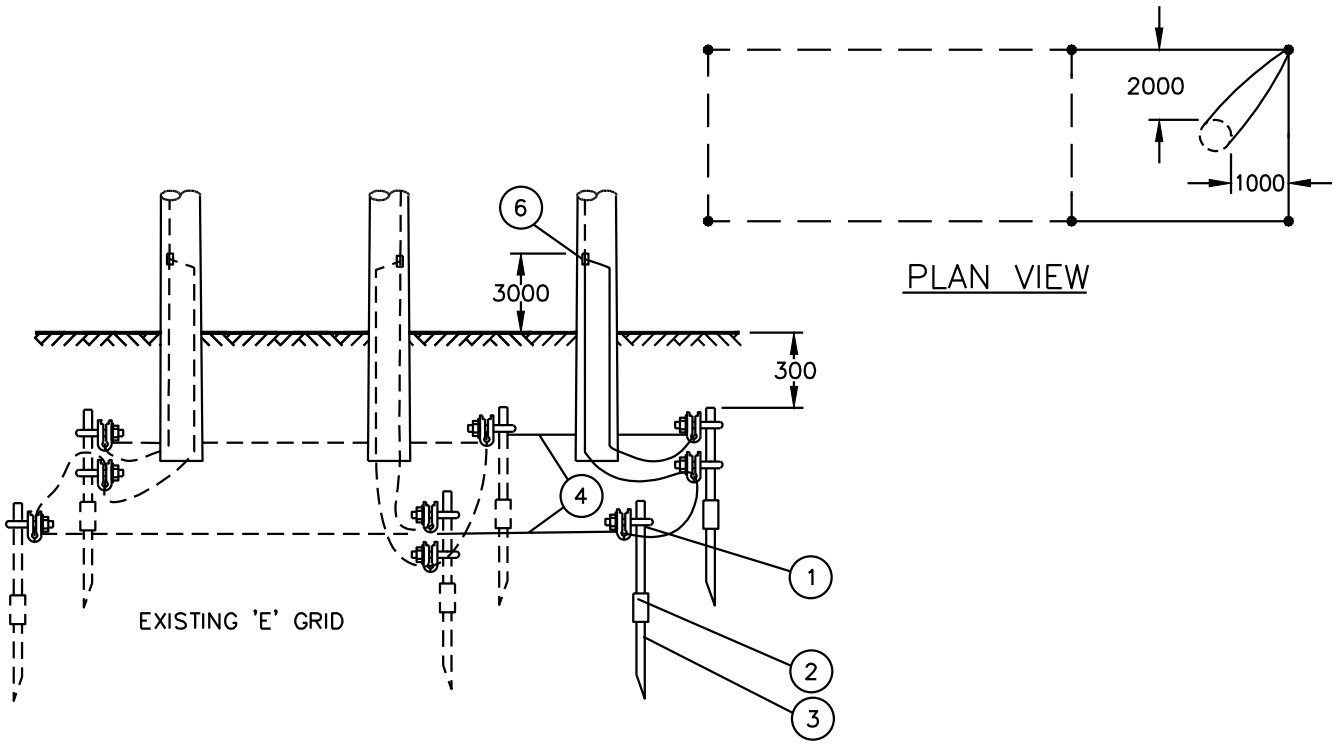


PLAN VIEW

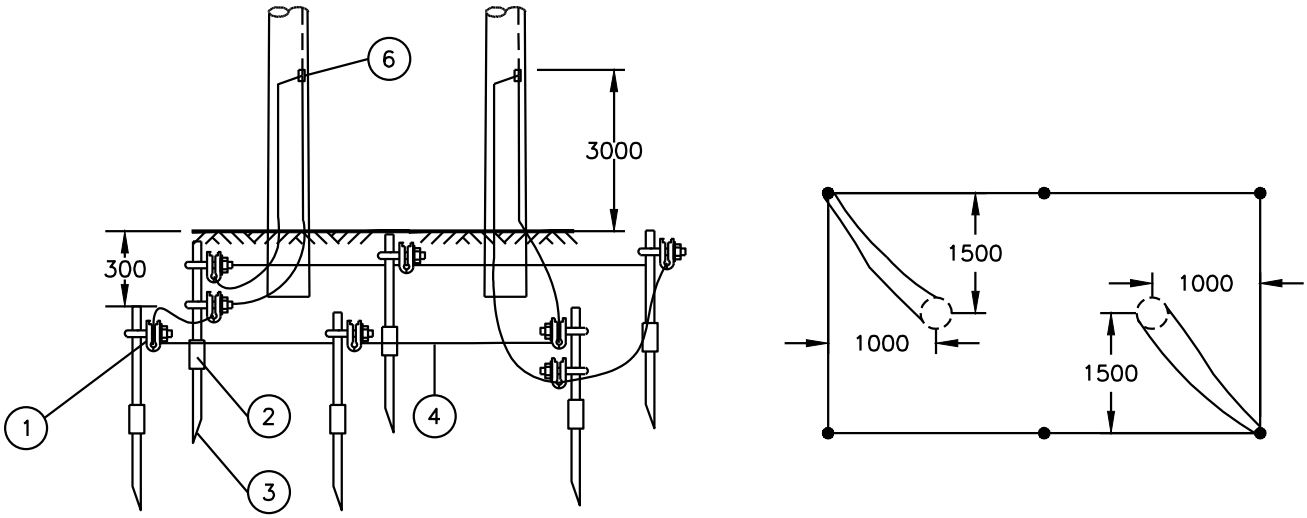
TYPE 'E' GROUND GRID

SCALE: N.T.S. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED

	SaskPower – DISTRIBUTION STANDARDS			
	APPROVAL L.MOEN	DESIGN CHK. A.UHREN	DRN. D.REDEKOPP CHKD. D.REID	GROUND GRID TYPES D, E, F & N
			2015–11–17	
	DATE OF ISSUE 2016/02/05		DRAWING NO. A–33–02	SHEET 2 of 3 REV. F



TYPE 'F' GROUND GRID

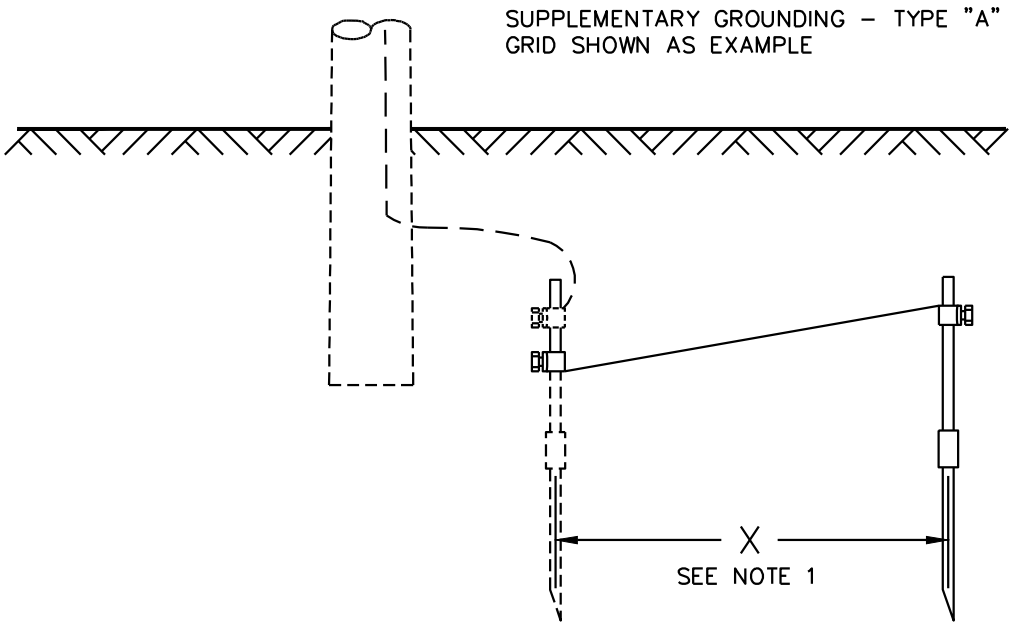


TYPE 'N' GROUND GRID

SCALE: N.T.S. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED

SaskPower – DISTRIBUTION STANDARDS			
APPROVAL L.MOEN	DESIGN CHK. A.UHREN	DRN. D.REDEKOPP CHKD. D.REID	GROUND GRID TYPES D, E, F & N
		2015-11-17	
DATE OF ISSUE 2016/02/05	DRAWING NO. A-33-02	SHEET 3 of 3	REV. B

SPC/AUTODRAFT



NOTE:

1. DISTANCE "X" SHOULD BE 1.5 TIMES THE LENGTH OF THE LONGEST ROD DRIVEN IN THE GROUND GRID. EXAMPLE: IF A 6m LENGTH OF ROD IS THE LONGEST ROD DRIVEN AS PART OF A GRID, THE SUPPLEMENTARY GROUND ROD SHOULD BE DRIVEN 9m (1.5 x 6m) OUT FROM THE EXISTING GROUND GRID. THE SUPPLEMENTARY ROD MAY BE CONNECTED TO ANY OF THE EXISTING GRID RODS WITH THE PHYSICAL SURROUNDINGS BEING THE DETERMINING FACTOR.

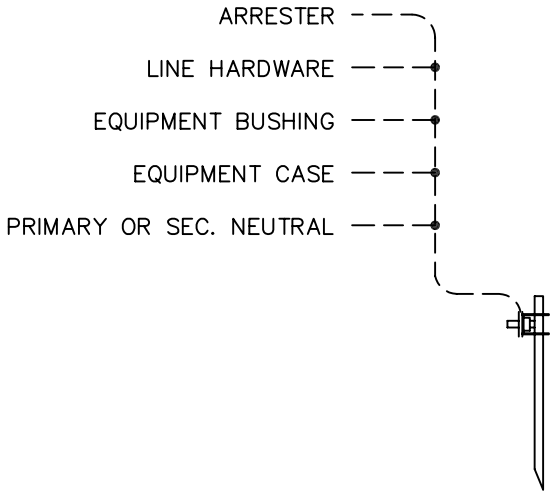
2. THE SUPPLEMENTARY ROD(S) SHOULD BE CONNECTED USING THE SAME SIZE BARE COPPER AS IN THE EXISTING GRID. IT IS RECOMMENDED THAT SECTIONAL RODS (CODE 26022) BE USED FOR SUPPLEMENTARY GROUNDING.

SaskPower – DISTRIBUTION STANDARDS			
APPROVAL L.MOEN	DESIGN CHK. A.UHREN	DRN. D.REDEKOPP CHKD. D.REID	SUPPLEMENTARY GROUNDING
		2015–11–17	
DATE OF ISSUE 2016/02/05		DRAWING NO. A–33–04	SHEET 1 of 1 REV. A

SPC/AUTODRAFT

SINGLE GROUND WIRE

– A SINGLE GROUND WIRE WILL BE RUN DOWN THE POLE WHERE ONLY A SINGLE ROD GRID IS INSTALLED.



– ARRESTER TO GROUND ROD WIRE WILL BE CONTINUOUS AND ALL OTHER GROUNDS CONNECTED TO IT.

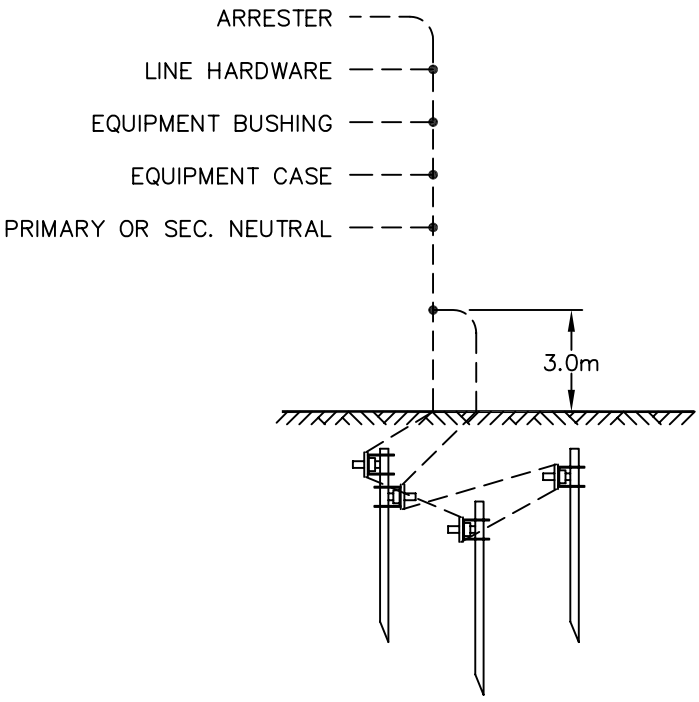
– IF THERE ISN'T AN ARRESTER, THE EQUIPMENT BUSHING TO GROUNG ROD WIRE WILL BE CONTINUOUS AND ALL OTHER GROUNDS CONNECTED TO IT.

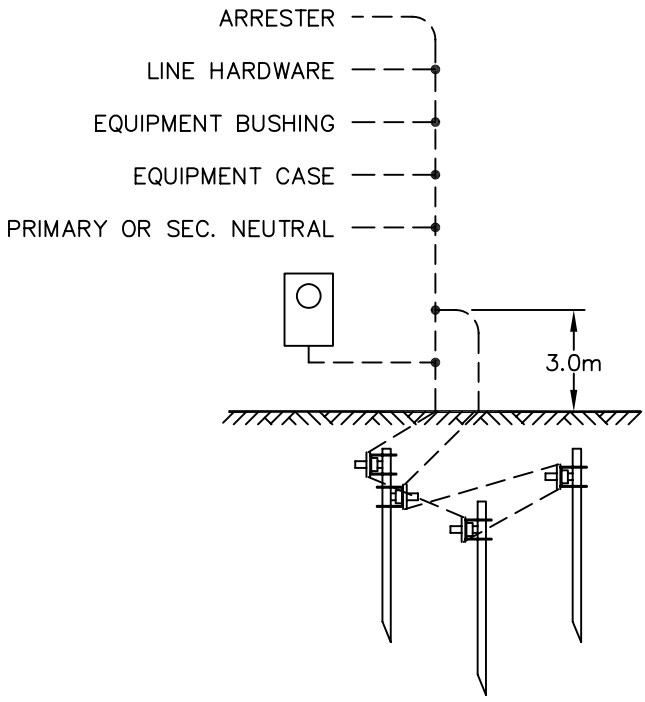
TWO GROUND WIRES

– WHEN A 3–ROD GRID IS INSTALLED, THE FIRST GROUND WIRE RUNS DOWN THE POLE, THE SECOND GROUND WIRE RUNS UP THE POLE 3 METRES WITH A MINIMUM SEPARATION OF 150mm AND A MAXIMUM SEPARATION AS NOT TO INTERFERE WITH CLIMBING, AND IS CONNECTED AT THIS POINT.

– ARRESTER TO GROUND ROD WIRE WILL BE CONTINUOUS AND ALL OTHER GROUNDS CONNECTED TO IT.

– IF THERE ISN'T AN ARRESTER, EQUIPMENT BUSHING TO GROUND ROD WIRE WILL BE CONTINUOUS AND ALL OTHER GROUNDS CONNECTED TO IT.





SCALE: N.T.S. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED

SASKATCHEWAN POWER CORP. – DISTRIBUTION ENGINEERING STANDARDS				
DRN. DK	DESIGN CHK.	SAFETY APP.	APPROVAL	GROUND WIRE INSTALLATION
CHKD. FTK				
DATE 87-05-12	DATE	DATE	DATE	
DATE OF ISSUE 87-06-01		DRAWING NO. A-33-05	SHEET 1 of 1	REV. 0

STRUCTURE TYPE	GROUND WIRE SIZE (AWG)	MAXIMUM RESISTANCE (OHMS)
1. TOWN SUBSTATIONS		
1.1 – 25kV – 2.4 / 4.16kV (PLATFORM TYPE)	#2	1.0
2. TRANSFORMER INSTALLATIONS		
2.1 – 25kV PRIMARY (PLATFORM TYPE)	#2	2.0
2.2 – 14.4 / 25kV PRIMARY		
UNDER 25kVA URBAN (WITH NEUTRAL) (SEE NOTE 2)	#4	10.0
UNDER 25kVA RURAL (EARTH RETURN)	#4	6.0
25kVA AND OVER	#4	2.0
2.3 – 2.4 / 4.16kV PRIMARY (SEE NOTE 2)	#4	10.0
3. GOPT SWITCHES		
3.1 – 25kV AND LESS HANDLES	#2	25.0
4. SAFETY GROUND		
4.1 – 25kV AND BELOW – (SEE NOTE 5)	#4	25.0
5. ARRESTERS - (SEE NOTE 3)	#4	10.0
6. RECLOSERS – (SEE NOTE 6)		
6.1 OCR TYPE 23XXX – (SEE NOTE 5)	#4	25.0
6.2 NOVA 243XX– (SEE NOTE 5)	#4	25.0
6.3 OVR 24353	#4	10.0
6.4 VERSA-TECH POLEMOUNT 24440	DO NOT GROUND	
6.5 TRIPSAVER 24450	DO NOT GROUND	
6.6 INTELLIRUPTER 24501	#2	25.0
7. MISCELLANEOUS INSTALLATIONS		
7.1 CAPACITOR	#2	2.0
7.2 REGULATOR	#2	2.0
7.3 AUTO TRANSFORMER	#4	2.0
7.4 METERING	#4	25.0
7.5 PRIMARY, SECONDARY NEUTRAL	#4	25.0
7.6 CABLE GUARDS	#4	25.0

NOTE:

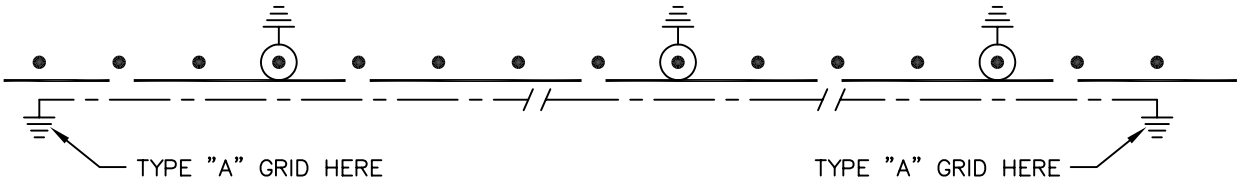
1. MAXIMUM RESISTANCE VALUES ARE FOR GROUND GRID ALONE, NOT CONNECTED TO ANY OTHER NEUTRAL OR GROUNDING SYSTEM.
2. 10 OHM RESISTANCE INDICATED FOR ITEMS 2.2 (14.4 / 25kV PRIMARY-URBAN) AND 2.3 (2.4 / 4.16kV PRIMARY), TAKES INTO ACCOUNT THE FACT THAT A SYSTEM NEUTRAL WILL BE PRESENT. THE OVERALL GROUND RESISTANCE WILL THEREFORE BE MUCH LOWER THAN 10 OHMS.
3. WHERE THERE ARE DIFFERENT OHMIC REQUIREMENTS FOR THE SAME STRUCTURE (DUE TO DIFFERENT APPARATUS TYPES), THE LOWEST VALUE WILL BE USED. EG: WHEN LIGHTNING ARRESTERS (10 OHM REQUIREMENT) ARE INSTALLED ON A CAPACITOR STRUCTURE (2 OHM REQUIREMENT), THE 2 OHM VALUE WILL BE THE MAXIMUM ALLOWABLE RESISTANCE.
4. WHERE THESE REQUIREMENTS CANNOT BE MET, UP TO TWO ADDITIONAL ROD SECTIONS OR TWO SUPPLEMENTAL GROUND RODS (A-33-04) SHALL BE INSTALLED FOR EACH ROD NORMALLY USED PER A-33-01 OR A-33-02. IF THE REQUIREMENTS STILL CANNOT BE MET, THEN AN UNDERGROUND OR OVERHEAD NEUTRAL WIRE SHALL BE RUN BACK TO ANOTHER GROUND GRID INSTALLED IN BETTER SOIL.
5. GROUNDS FOR PERSONNEL PROTECTION AND EQUIPMENT CASE GROUNDING.
6. GROUND WIRE SIZE IS TYPICAL BUT VALUES IN A-26 TAKE PRECEDENCE.

SPC/AUTODRAFT

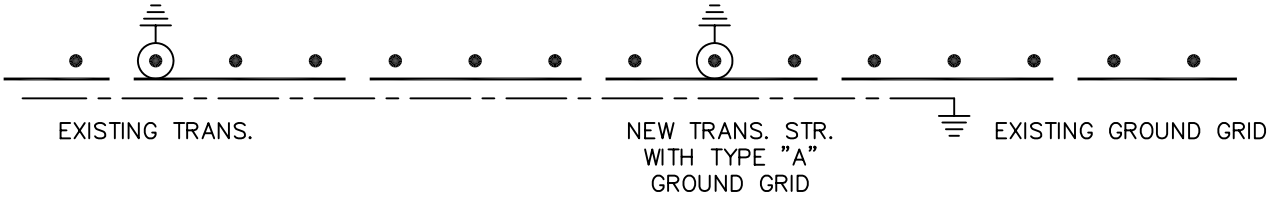
TYPE "A" SINGLE ROD GRID INSTALLATIONS

INSTALL SINGLE ROD GRIDS:

1. AT THE ENDS OF ALL SECONDARY AND SYSTEM NEUTRAL RUNS. SEE NOTE 1.



2. AT ALL TRANSFORMER INSTALLATIONS WHERE A CONTINUOUS METALLIC NEUTRAL EXISTS AND WHICH HAVE A MINIMUM OF TWO EXISTING GROUND GRIDS CONNECTED. SEE DWG. A–33–08 FOR EXCEPTION.



NOTE:

1. A SYSTEM NEUTRAL SHALL BE GROUNDED AT A MINIMUM OF 4 LOCATIONS PER KILOMETRE. THE MAXIMUM DISTANCE BETWEEN ANY TWO OF THE ABOVE LOCATIONS SHOULD BE 370m. IF THERE ARE NOT ENOUGH EXISTING GROUNDS (TRANSFORMERS, CAPACITORS, ETC.) TO MEET THE REQUIREMENT, ADD THE APPROPRIATE NUMBER OF TYPE "A" GROUND GRIDS.

2. FOR GROUNDING SECONDARY OR SYSTEM NEUTRAL WITH A TYPE "A" GROUND GRID, THE FOLLOWING ADDITIONAL MATERIAL WILL BE REQUIRED.

1/2 LB. OF	1–85–01 – STAPLES, FENCE
12 OF	1–85–02 – STAPLES, MOULDING
30 FT. OF	2–27–00 – MOULDING, GROUND WIRE
10m OF	2–83–04 – WIRE, COPPER – #4 – 7 STR. BARE
1 OF	5–09–XX – CONNECTOR, COMPRESSION

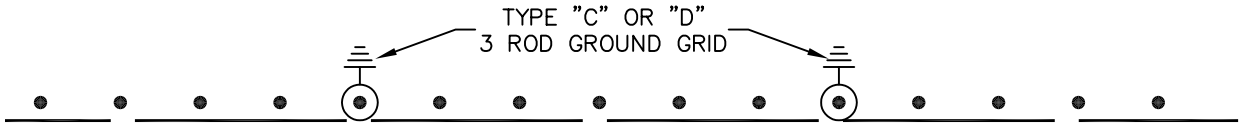
SASKATCHEWAN POWER CORP. – DISTRIBUTION ENGINEERING STANDARDS					
DRN. DK	DESIGN CHK.	SAFETY APP.	APPROVAL	USE OF TYPE "A" GRID IN URBAN DISTRIBUTION	
CHKD. FTK					
DATE 87–05–21	DATE	DATE	DATE		
DATE OF ISSUE 87–06–01			DRAWING NO. A–33–07	SHEET 1 of 1	REV. 0

SPC/AUTODRAFT

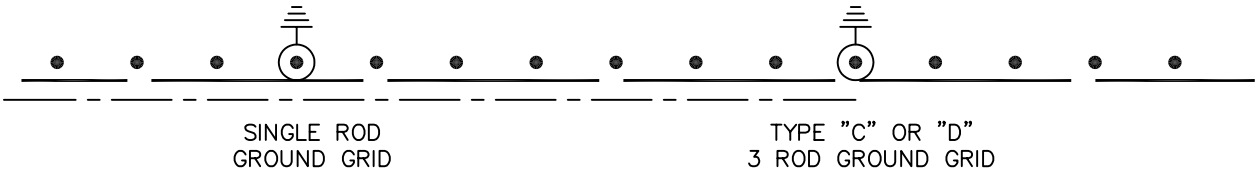
TYPE "C" AND "D" GROUND GRID INSTALLATIONS

INSTALL TYPE "C" OR "D" 3 ROD GRIDS:

1. AT ALL ISOLATED 14.4 kV AND 25 kV TRANSFORMER INSTALLATIONS WHERE THERE IS NO SECONDARY OR SYSTEM NEUTRAL.



2. AT A TRANSFORMER STRUCTURE WHERE THE SECONDARY OR SYSTEM NEUTRAL TERMINATES. THIS APPLIES FOR ALL 2.4 kV, 4.16 kV, AND 25 kV TRANSFORMER INSTALLATIONS, REGARDLESS OF THE NUMBER OF OTHER GROUND GRIDS INTERCONNECTED VIA METALLIC NEUTRAL.



SASKATCHEWAN POWER CORP. – DISTRIBUTION ENGINEERING STANDARDS					
DRN. DK	DESIGN CHK.	SAFETY APP.	APPROVAL	USE OF TYPES "C" AND "D" GRIDS IN URBAN DISTRIBUTION	
CHKD. FTK					
DATE 87-05-21	DATE	DATE	DATE		
DATE OF ISSUE 87-06-01			DRAWING NO. A-33-08	SHEET 1 of 1	REV. 0