

600 VOLT UNDERGROUND CABLE & CONDUIT SELECTION GUIDE

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2.0 PURPOSE

This guide is to provide information necessary for the economical application of underground service cables. The eight tables in Section 5.0 include conduit sizes, number of conduits, required number of cables, and cable ampacities for single and three phase services.

3.0 DISCUSSION


This standard should be utilized to size all underground service cables for residential, commercial and industrial applications. The development of this standard incorporates both economic and physical constraints. *The economic analysis used to develop the cable applications includes all associated materials.* Therefore, the application of this standard will result in the most economical and reliable installation for both NVE and its Customers. **All Services should be as short as possible to minimize cable losses, especially heavily loaded 3 phase service cables.** Electric Utility Service Equipment Requirements Committee (EUSERC) specifications for landing lugs and box dimensions were also considered during the development of this standard. The EUSERC requirements dictated some of the cable applications.

4.0 APPLICATION NOTES

- A. Secondary or service cables shall be 600 volt XLPE AL in #2, 2/0, 4/0, 350, and 750 KCM sizes. The cable shall be installed in a conventional duct system or in a cable trench. The cable shall be selected and installed to meet expected demands.

Large single phase residential and three phase commercial services often require parallel runs of cable. Tables 1 through 8 must be used to determine cable ampacity when multiple sets of cable are utilized to minimize cable losses.

For services requiring 750 TPLX or 750 QUAD, the maximum service length will be 150 feet from transformer to pull box, pull box to pull box, transformer to panel or box to panel. Also; if service exceeds 150 feet access to the panel is required for cable pulling. Access is defined as 9 feet from curb to center of transformer pad or box, 10 feet from curb to exterior panel or for interior panels (not recommended) 10 feet to electrical room access entry.

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- B. Use caution when applying this standard. *The peak load of large services must be checked against the ampacity of the cable combination given in the table.* If required, the number of cables should be increased to match the demand.
- C. Service load is assumed to be 65% of the main panel with respect for load factors of either over/under 75%. The under 75% LF cable loading should be utilized for most customers. **Panels with exposed riser conduits must use the 100% LF data.**
- D. Conduit should always be sized according to panel size, regardless of estimated load at the time service is provided. This allows for the future economical addition of cables if the customer's load grows.
- E. *Evaluation of flicker/voltage drop is necessary for applications involving long distance or heavily loaded cables.*

5.0 TABLES

**TABLE 1
SINGLE PHASE - THREE WIRE SERVICES**

Customer Main Panel Rating (Amps)	Estimated Peak Load (65%) (Amps)	Required Conductor Size (ALU. XLPE)	Cable Stock Number	Thermal Ampacity of Service @ 100% LF	Conduit Number – Size (1)
100	65	#2 Triplex	23-0265	115	1-3"
200	130	2/0 Triplex (2)	23-0520	175	1-3" (2)
320/400	260	350 Triplex	23-0783	330	1-3"
600	390	2-350 Triplex (3) (4)	23-0783	627	2-3"
800	520	2-350 Triplex (3) (4)	23-0783	627	2-3"
1000 (6)	650	2 -750 Triplex (5)	4: 23-0895 2: 23-0781	985	2-4"
1200 (7)	780	2-750 Triplex (5)	4: 23-0895 2: 23-0781	985	2-4"

NOTES: TABLE 1

1. Conduit size will vary depending upon local requirements and construction practices. Consult the local NVE district prior to construction, for the correct conduit size.
2. 4/0 Triplex might be needed for fully loaded panels, or long service runs.
3. One 750 KCM in 1-4" conduit can be used as an alternative.
4. Use two-750 KCM (23-0895) and one-350 KCM (23-0781) XLPE conductors.
5. Use four-750 KCM (23-0895) and two-350 KCM (23-0781) XLPE conductors.
6. 1000A is the maximum single phase panel size; larger loads will require a three phase panel.
7. 1200A - reference only.


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TABLE 2
THREE PHASE - FOUR WIRE SERVICES

Customer Main Panel Rating (Amps)	Estimated Peak Load 65% (Amps)	Required Conductor Size (al XLPE)	Cable Stock Number	Thermal Ampacity of Service @ 100% / 75% LF		Number of Conduits and Size (1)
100	65	1-#2 str Quad	23-0270	110	120	1-3"
200	130	4/0 Quad	23-0670	215	240	1-3"
400	260	1-350 Quad	23-0784	305	326	1-4"
600	390	1-750 KCM per phase with 1-350 KCM neutral	750 - 23-0895 350 - 23-0781	480	520	1-4"
800	520	2-750 KCM per phase with 2-350 KCM neutral	750 - 23-0895 350 - 23-0781	860	940	2-4"
1000 (1)	650	2-750 KCM per phase with 2-350 KCM neutrals	750 - 23-0895 350 - 23-0781	860	940	2-4" (3-4")
1200 (1)	780	3-750 KCM per phase with 3-350 KCM neutrals	750 - 23-0895 350 - 23-0781	1110	1275	3-4" (4-4")
1400 (1)	880	3-750 KCM per phase with 3-350 KCM neutrals	750 - 23-0895 350 - 23-0781	1110	1275	3-4" (5-4")
1600 (1)	1040	4-750 KCM per phase with 4-350 KCM neutrals	750 - 23-0895 350 - 23-0781	1320	1520	4-4" (6-4")
2000 (1)	1300	5-750 KCM per phase with 5-350 KCM neutrals	750 - 23-0895 350 - 23-0781	1525	1780	6-4" (7-4")
2001 - 4000 (2)	See GI0011U, Section 7- Services					

NOTES: TABLE 2

- 100% rated panels above 800 amp require the conduits (4-4"), as indicated by the number in parenthesis.
- Cable Trench (GI0011U) is required on 2001 amp or larger panel ratings. The number of cable runs and their ampacities are listed in Table 8 of this standard.


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TABLE 4
AMPACITIES OF U/G XLPE ALUMINUM CABLES IN CONDUIT

SINGLE PHASE				THREE PHASE			
# of Runs	Cable	Ampacity		# of Runs	Cable	Ampacity	
		100% LF	50% LF			100% LF	50% LF
1	#2 Triplex	115	140	1	#2 Quad	110	120
1	2/0 Triplex	175	195	1	2/0 Quad	160	185
1	4/0 Triplex	235	285	1	4/0 Quad	215	240
1	350 Triplex	330	385	1	350 Quad	305	326
1	750 Triplex (1)	520	600	1	750 Quad (1)	480	520
2	4/0 Triplex	470	520	2	350 Quad	550	620
2	350 Triplex	627	710	2	750 Quad	860	940
2	750 Triplex	985	1120	3	350 Quad	720	825
3	350 Triplex	845	990	3	750 Quad	1110	1275
				4	750 Quad	1320	1520
				5	750 Quad	1525	1780
				6	750 Quad	1740	2070
				7	750 Quad	2010	2250
				8 (2)	750 Quad	2230	2420
				10 (2)	750 Quad	2680	2815
				12 (2)	750 Quad	3150	3320
				14 (2)	750 Quad	3640	3800
				16 (2)	750 Quad	4140	4280

NOTES: TABLE 4**1. 750 KCM is not available in Triplex or Quad configuration.**

Use 2-1/C- 750 KCM (23-0895) and 1-1/C- 350 km (23-0781) XLPE conductors or

Use 3-1/C- 750 KCM (23-0895) and 1-1/C- 350 km (23-0781) XLPE conductors.

2. Reference only. See Cable Trench Installation Guide for new construction, GI0011U and Table 8 of this standard show ampacities of cables in cable trench.


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TABLE 5
SINGLE PHASE SERVICE OR SECONDARY CABLE
50% LOAD FACTOR - SUMMER

Size (AWG or KCM)	Number of Circuits in Duct Bank			Riser (Exposed)
	One	Two	Three	
	Amps	Amps	Amps	
#2	140	132	125	115
2/0	195	187	180	175
4/0	285	260	250	235
350	385	355	335	330
750	600	555	525	520

TABLE 6
DESIGN LIMITS FOR RESIDENTIAL CABLES
SINGLE CONDUIT RUNS

Size (AWG or KCM)	Summer	
	Economic Limits	Thermal Limits
	Amps- Kva	Amps- Kva
#2	80- 19	140- 33
2/0	115- 28	195- 46
4/0	171- 41	285- 68
350	230- 55	385- 92
750 (*)	390- 94	600- 144

(*) 750KCM shown for reference only- 350 KCM is normally the largest cable used for residential design.

TABLE 7
THREE PHASE SERVICE CABLES
LOAD FACTOR AS SHOWN - SUMMER AMPACITY

Size (AWG or KCM)	Number of Circuits in Duct Bank								
	One			Three		Four		Six	
	75%	100%	Riser (Exposed)	75%	100%	75%	100%	75%	100%
#2	120	110	100	105	95	100	90	92	80
2/0	185	160	150	165	130	150	120	130	110
4/0	240	215	210	206	185	190	160	175	150
350	326	305	295	275	240	250	225	230	200
750	520	480	470	425	370	380	330	345	290

TABLE 8
THREE PHASE SERVICE CABLE AMPACITIES
INSTALLED IN TRENCH - GI0011U.

Sets of Cables (Wire Size)	4 (750)	5 (750)	6 (750)	7 (750)	8 (750)	9 (750)
24" x 30" (ID) Cable Trench - (GI0011U)	1880	2350	2820	3290	3760	4230

Per NEC 318-10 and 318-11(b)1.

The cable runs must be racked with the proper clearances to provide the capacities listed in **Table 8**.