



HOW TO SELECT AND PROPERLY USE WIRE

Wire is designed to tolerate specific conditions and to do only those jobs for which it is intended. It is advisable to understand the popular uses of the most common types of wire used in residential, farm, and small workshop applications before you begin your job. We will also give some general wiring information that pertains to good wiring practices.

All wires, except those used to rewire existing buildings where the wires are fished into the walls, must be stapled or strapped at least every 4-1/2 feet and within 12 inches of entry to any metal box or within 8 inches of entry to any nonmetallic box without clamps. Some areas require 4" or 6" for nonmetallic boxes so verify with your local Grover staff. Care must be taken while driving staples or tightening clamps to make sure that the cable is not injured. See NEC article 334.30. *

Pigtails at least 6" long must be left at all boxes for making up device connections or splices. Ground wires should be connected together at all switch, receptacle, fixture, and junction boxes at the time of rough-in. Metal boxes should be grounded by using an approved ground clip or screw to bond the box. If a grounded device is to be installed in the box, a pigtail should be left for this purpose. It is advisable to make up all wiring joints, except for the installation of devices at the time of rough-in while the cables are still visible. It is also good practice to run a continuity test on all wiring prior to covering. See NEC article 300-14.*

Poor wire connections cause nearly all electrical failures. This segment of your work deserves particular emphasis. All splices and connections must be made in an approved box that will always be accessible. Twist-on connectors do a good job. They must be tightened *securely*. When making aluminum or copper to aluminum

splices, make sure that the connectors are approved for that use. *A liberal coating of corrosion inhibitor should be applied to all aluminum wire joints. See article 300 and 300-15 of the NEC for additional general wiring information.* *

NMB CABLE

NM stands for nonmetallic. It refers to the most commonly used type of wire. It is also called loom wire, Loomex or Romex (trade names) or just plain building wire. It can be run through holes drilled in the center of wall studs, floor and ceiling joists, and rafters. It must be concealed by cover material such as sheet rock, plaster, plywood, etc., in all areas except where access is so limited that it would be unlikely that the wire would be subject to injury. Areas where cover is usually not needed are crawl spaces under houses and non-accessible attics beyond six feet back from the scuttle hole. When wires are run across the tops of joists in accessible attics, they should only be run outside the rafter supports or near the edge where the clearance between the joists and rafters is less than 18 inches. An accessible attic is one that is equipped with a permanent stairway. We stock copper NM-B cable from #14-2 to #2-3. *We suggest that you read articles 300 and 334 of the National Electric Code before commencing work with NM cable.*

SEU CABLE

Aluminum **S**ervice **E**ntrance cable, **U**narmored has two insulated conductors with an un-insulated ground wire that is wrapped around the conductors, and a final outer covering. Though its use is not universally applicable, it is most commonly used in larger sizes to connect adjacent electrical meters and panel boards. *See articles 230, 300 and 338 of the National Electric Code for more SE cable information.*



SER CABLE

This wire is the same as SE cable except that it has an insulated neutral wire and is round instead of the flat U style. We stock only that which has an additional ground wire which qualifies it for use as a sub service feeder and for range and dryer circuits that require a separate ground wire. *The same methods and NEC articles prevail as for SE cable.*

THHN & THW WIRE

THHN means thermoplastic high heat resistant. The better insulation quality of THHN wire permits it to carry a somewhat heavier amperage load. Although triplex and quadplex service drop cables are the most popular for open air applications, THHN wire is still occasionally used on small jobs such as outdoor lighting, etc. THHN and THWN wires are now primarily used in conduit systems. Industrial and commercial wiring must be done in this manner. We stock a complete line of copper THHN/THWN in sizes from #14 to #2.

TYPE "USE" WIRE & UF CABLE

These wires are designed for underground use. Burial depth for this type of wire is 24 inches. Residential branch circuits of 120 volts or less with GFCI protection and maximum overcurrent protection of 20 amps only need to be 12 inches deep. In areas where spading or tilling might occur, buried cables should be physically protected with conduit or by placing a board over it in the trench. Where these wires exit from the ground, they should be in conduit. Some local codes and/or utility companies require deeper burial of underground service conductors. USE wire can be used as main feeder, sub feeder, and branch circuit wiring. UF is stocked only in cable form and is only used as branch circuit or sub feeder wiring and must be protected by a proper sized fuse or breaker. UF, when used inside of a building, must conform to NM wiring procedures. It is stocked only with copper conductors in cables sized from #14-2 with ground to #6-3 with ground. USE is stocked in aluminum from #6 AWG to 250 MCM and in copper from #8 to #3/0. *See articles 300-5, 310-6, 338, and 339 of the NEC for more information on USE and UF wiring.*

**NEC refers to the National Electric Code.*

URD

URD is a cable composed of three loosely twisted individual conductors. This cable can be buried directly in the ground (24 inches) and is used for underground service entrances and sub feeds to outbuildings. Check local codes for use and application before purchasing.



ALUMINUM WIRE AND ITS POPULAR USE		
TYPE	SIZE	GENERAL USES
SEU U Style Cable	#4/0-3	main conductors for 200 amp services
SER Round Cable	#8-3 w/gnd	dryers, feeders for 30 amp 230 volt SUB services
	#6-3 w/gnd	ranges, feeders for 50 amp 230 volt SUB services
	#4-3 w/gnd	feeder for 60 amp 230 volt SUB services
	#1-3 w/gnd	feeder for 100 amp SUB services
	#4/0-3 w/gnd	feeder for 200 amp SUB services
USE Single Conductor Underground	#8	water pumps*
	#6	feeders for 50 amp underground SUB services, water pumps*
	#4	feeders for 70 amp underground SUB services, water pumps*
	#2	neutral conductor for 100 amp underground services**
	#1	main conductors for 100 amp underground services**
	#2/0	neutral conductor for 200 amp underground services**
	#4/0	main conductors for 200 amp underground services**
URD Three Conductor Underground	#2	underground feeds for 70 amp services, large water pumps*
	#1/0	underground feeds for 100 amp services**
	#4/0	underground feeds for 200 amp services**

* Size of motor and distance of run determine what size of wire is needed
 ** Some areas do not permit underground aluminum service conductors

COPPER WIRE AND ITS POPULAR USE			
TYPE	SIZE	GENERAL USES	
NMB Nonmetallic Cable (Romex)	#14-2 w/gnd	general lighting and receptacle circuits (for homes only)	
	#14-3 w/gnd	3-way switching on 15 amp circuits, split receptacle circuits	
	#12-2 w/gnd		all #14-2 uses (general lighting and receptacle circuits) kitchen and bathroom receptacle circuits
			230 volt heat circuits up to 3,700 watts 115 volt heat circuits up to 1,800 watts
	#12-3 w/gnd	3-way switching on 20 amp circuits, split receptacle circuits	
	#10-2 w/gnd	230 volt heat circuits up to 5,500 watts, all water heater circuits	
	#10-3 w/gnd	dryers*, individual cook tops and wall ovens (refer to nameplate) feeders for 30 amp 230 volt SUB services	
	#8-2 w/gnd	larger heat pump/AC compressors 230 volt heat circuits to 7,300 watts 50 amp welding circuit	
	#8-3 w/gnd	most heavy-duty cook tops & wall ovens (refer to nameplate) feeders for 40 amp 230 volt SUB services	
	#6-2 w/gnd	larger heat pump/AC compressors 230 volt heat circuits to 11,000 watts	
	#6-3 w/gnd	free-standing ranges, feeders for 60 amp 230 volt SUB services	
	#4-3 w/gnd	feeder for 70 amp SUB services	
#2-3 w/gnd	feeder for 100 amp SUB services		

* Check with local code enforcing authority before installing



COPPER WIRE AND ITS POPULAR USE		
TYPE	SIZE	GENERAL USES
THHN/THW Wire	#14	15 amp lighting and receptacle circuits in conduit
	#12	20 amp lighting and receptacle circuits in conduit
	#10	30 amp feeders in conduit 30 amp feeders to a pumphouse in conduit
	#8	50 amp feeders, SUB services to outbuildings in conduit
	#6	60 amp feeders SUB services to outbuildings in conduit
	#4	70 amp feeders, neutral conductor for 100 amp services neutral conductor for 100 amp service
	#2	main conductors for 100 amp service
UF Underground Feeder Cable	#14-2 w/gnd	garden, walkway and post lamp lighting circuits
	#14-3 w/gnd	3-way switching to outbuildings
	#12-2 w/gnd	all #14-2 uses lighting circuits to small outbuildings some 2-wire water pumps (refer to nameplate)**
	#12-3 w/gnd	3-way switching to outbuildings lighting and receptacle circuits to outbuildings some 3-wire water pumps (refer to nameplate)**
	#10-2 w/gnd	feeder for 30 amp 115 volt SUB service to outbuilding some 2-wire water pumps (refer to nameplate)**
	#10-3 w/gnd	feeder for 30 amp 230 volt SUB service to outbuilding some 3-wire water pumps (refer to nameplate)**
	#8-3 w/gnd	feeder for 40 amp 230 volt SUB services spas and hot tubs
	#6-3 w/gnd	feeder for 60 amp 230 volt SUB services spas and hot tubs
USE Single Conductor Underground	#8	water pumps** temporary (builder's) services
	#6	water pumps** hot tubs underground feeders for 60 amp SUB services to outbuildings
	#4	neutral conductor for 100 amp underground services/SUB feeds underground feeders for 70 amp SUB services to outbuildings
	#2	main conductors for 100 amp underground services
	#1/0	neutral conductors for 200 amp underground services
	#3/0	main conductors for 200 amp underground services
** Motor size and distance of run determine what size wire to use		