

WIRING THE FARMSTEAD

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One of the most important problems that confront the farmer in using electricity on the farm is that of wiring the farm buildings. A good farm wiring system, in addition to being safe, should permit the farmer to use electric service to its fullest advantage in lighting buildings and grounds and in doing the manifold tasks of household work and farm chores. The problem of wiring the farmstead includes consideration of size of service, wiring specifications, and contracting the wiring job.

Wiring Specifications

The first step in securing a satisfactory wiring job is to do the planning before the job is started or the contract is let. Where funds are not available for a complete wiring job, only as much should be done as reliable work and available funds will permit, planning the work so that future additions can be made at a minimum of expense.

What to Do

1. Install a 60 or 100 ampere entrance service switch. The 100 ampere switch has capacity to operate a 5 horsepower motor, the electric range, the lighting system, the pump, and household appliances at the same time. A 60 ampere switch should be the minimum size used on a farm. A switch of this size does not, of course, permit as wide range of electric uses at one time as does the 100 ampere switch. The combined demand of the electric range and 5 horsepower motor may exceed 60 amperes and leave no reserve for lighting or other uses.

If the present plans do not include the electric range or larger motors, they should include the large entrance switch to provide for future additions.

2. Sketch the farmstead lay-out and floor plans of the house and farm buildings and mark location of all outlets.

House Wiring

1. Basement: Locate lamp outlets for stairway, furnace, laundry, and fruit room. Use "weatherproof" lamp sockets. Locate switch control at top of stairs for stairway light and place switches at base of stairs and in fruit room for other lights. Have two duplex convenience outlets (plugs), one for laundry equipment and one for soft and hard water systems.

2. Kitchen: Have a ceiling light outlet, a bracket lamp over sink or work table, and the switch control at main entrance. Use two duplex convenience outlets, one above work table for cooking appliances and small motors and one above baseboard for refrigerator or other equipment. A third convenience outlet may be needed for the clock and fan.

3. Dining room: Place ceiling lamp outlet over center of table and the switch control at main entrance. A duplex convenience outlet should be suspended from the ceiling outlet above table and connected directly to lighting circuit and not to lighting fixture wires. Use this for toaster, percolator, and waffle iron.

4. Living room: Control ceiling light outlet by switch at front doorway. If stairway leads from living room, two 3-point switches should be used, one at head of stairs and one at main entrance. Also use 3-point switches if stairway leads from

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dining room or kitchen. Use two or more double convenience outlets to care for floor lamps, radio, and changes in placement of furniture.

5. Hall and stairway: Locate ceiling light in upper hall to light stairway from top to bottom, two lights may be needed in long halls. Place 3-point switch controls at bottom and top of stairs.

6. Bedrooms: Have ceiling light outlet with switch control at doorway. Plan for one or two duplex convenience outlets for bed lamp, table lamp, and heating pad. Provision should be made in locating the convenience outlets to allow for changing the position of furniture.

7. Clothes closets: Place a ceiling light inside the closet and near the door. Use a pull chain switch.

8. Bathroom: One bracket lamp on each side of the mirror is needed, and large bathrooms may also require a ceiling lamp. Have wall switch control at entrance and a duplex convenience outlet for appliances. No switch or lamp should be within reach of a person in the bathtub or shower.

9. Attic: One or more lights controlled by wall switch at base of stairs should be provided.

General

A minimum of four circuits should be installed. A general recommendation is a circuit of No. 12 wire for basement service; a circuit of No. 12 wire for convenience outlets in the kitchen; a circuit of No. 14 wire for all first floor lighting and convenience outlets in dining room and living room; and a circuit of No. 14 wire for second floor and attic service. In no case, in either house or barn, should a circuit of No. 14 wire have more than 12 outlets, nor should it carry more than 1200 watts.

Do not use wire smaller than No. 14 on any circuit.

Side wall lights in bedrooms, living room, or dining room are more generally used for decorative purposes than to furnish good illumination. Tumbler type or push switches are preferable to snap switches.

List the specifications for each room as outlined on the estimate sheet.

Barns and Outbuildings

Dairy barn: Place row of lights over each row of cattle, four ft. back of stanchion rail, spaced 10-15 ft. apart. Provide lights on each side of barn controlled by separate switches at convenient location. Lights in feed alleys are often desirable. Convenience outlets should be located so that the portable milker, clipping machine, and small motors can be operated without the use of long extension cords. One power outlet for pipe line milker is necessary.

Horse barn: Have ceiling lights in center of alley, one light back of every other stall partition, a wall switch control at entrance, and one or more lamps in feed alley.

Poultry house: Lamps should be six feet above floor and 10 feet apart, provide two circuits, one for lighting and one for water heaters.

Hay mows, silo chute, stairways, and outbuildings should be adequately lighted, all lights to be controlled by wall switches.

Yard lights: Place lights between house and barn, controlled at two or three different places. A barnyard light illuminating space between barns and straw stack is often desirable. All yard lights should be equipped with reflectors.

General

Provide a separate 220 volt circuit for all motors larger than $\frac{1}{2}$ horsepower. For runs up to 100 feet use No. 12 wire for 1 horsepower, No. 10 wire for 2 horsepower, No. 8 wire for 3 horsepower, and No. 6 wire for 5 horsepower. Increase wire one size for each additional 100 ft.

All lights in outbuildings should be provided with porcelain lined metal reflectors. An electric lamp in direct contact with wood, hay, or other inflammable material will start a fire; the reflector eliminates this hazard and provides better illumination. Use rubber covered copper wires on all interior wiring and weatherproof copper wire between buildings. All fittings in barns and stables should be galvanized.

Fuse Protection

Table No. II gives the maximum carrying capacity in amperes of copper wire. The larger the wire the more current it can safely carry. Consult this Table and fuse accordingly. Note particularly that No. 14 rubber covered wire, ordi-

narily used for house circuits, is rated to safely carry only 15 amperes. Such a circuit should never be fused with larger than a 15 ampere fuse. When the proper size fuse proves too small, add more circuits. A wire carrying too much current overheats, breaks down the insulation, and constitutes a fire hazard.

Relation of Distance to Wire Size

Current flowing along a wire may be compared to water flowing in a pipe. The greater the distance the water flows, the larger the pipe size required; and the greater the distance the current flows, the larger the wire required. In planning the proper size wire to use between buildings, measure the distance between buildings and determine the amount of current to be needed at the end of the extension. It is usually wise to plan for 5 horsepower motor capacity at the main barn and the electric range at the house. Table No. I gives the proper size wire to use. When the entrance service switch is located in the house, the neutral (center) wire to the barn may be one size smaller than the other two wires.

Wiring Material

The three common types of wiring in general farm use are non-metallic sheathed cable such as "Romex," metallic armored cable known as "Bx," and knob and tube. Knob and tube is less used than the other types because of difficult installation between walls and floors and the lack of protection against mechanical injury. On short leads in open wiring, knob and tube is often used in combination with other types. Both metallic and non-metallic cables may safely be used in open or concealed wiring; both types are resistant to mechanical injury. The disadvantages of the metallic cable are rusting and the hazard of converting the metal covering into a conductor of electricity through a short circuit.

Rigid conduit is generally considered too expensive for farm wiring. Its main advantage is the protection it affords against mechanical injury.

Contracting the Job

1. After the plans and wiring specifications have been determined and listed on the estimate sheet, consult two or more reliable contractors and secure bids on the job.

2. Be sure the contractors have a reputation for dependability and are financially responsible.

3. All materials used should have the approval of Underwriters' Laboratories or be of equivalent grade.

4. All work should be done according to National Electric Code as well as local, state, and power company regulations.

5. If possible, hire local inspection or get the approval of the power company before paying for the job in full.

There are many ways in which a contractor of doubtful standing can reduce his bid through poor workmanship and by using materials below standard.

Table I—110-220 Volt Service Weather-proof B & S Gauge.

No. of Wires	Size of Wires	Distance Between Buildings
3	8	Up to 150 feet
3	6	Between 150-250 "
3	4	Between 250-400 "
3	3	Between 400-500 "
3	2	Between 500-650 "
3	1	Between 650-800 "
3	0	Between 800-1000 "

Permits electric range operation at house and 5 horsepower motor at barn. Use next size larger wire for 7½ horsepower.

Table II.—Maximum Safe Current Carrying Capacity of Copper Wire.

Wire Size B & S Gauge	Rubber Covered Amperes	Weatherproof Amperes
18	3	5
16	6	10
14	15	20
12	20	25
10	25	30
8	35	50
6	50	70
4	70	90
2	90	125
1	100	150
0	125	200

Adapted from National Electric Code.

Estimate Sheet

List wiring specifications here, submit copy to contractor.

	Lights		Plugs	Switches			Kind of Wiring	Lights	Plugs		Switches	
	Ceiling Outlets	Brackets Outlets	Duplex Outlets	Single Point	Three Point				110 V. Outlets	220 V. Outlets	Single Point	Three Point
Kitchen						Barn, Horse						
Pantry						Barn, Cow						
Dining Room						Barn, Sheep						
Living Room						Barn Floor						
Parlor						Barn—Hay Mow						
Sun Parlor						Silo						
Den						Granary						
Hall, Upper						Milk House						
Hall, Lower						Brooder House						
Bedroom						Poultry House						
Bedroom						Garage						
Bedroom						Shop						
Bath						Shed						
Clothes Closets						Hog House						
Stairs, Front						Calf Pen						
Stairs, Back						Wood Shed						
Vestibule						Yard						
Porch, Front												
Porch, Back												
Attic												
Cellar												

Meter Service Switch Size 60 or 100 Amperes: One Branch Circuit 60 Amperes for Barn.

..... Branch Circuits for House.

Feeder Circuit to Barn—three wires: Size

Range Circuit with power plug in kitchen—wire size: No. 6.

Water Pump Circuit to end at wire size

Transformer for Bell, located in cellar

Burglar Alarm

Yard Light—one switch at house: one switch at

Four-point Switches at

House Wiring to be: K & T: Non-metallic: Armored Cable: