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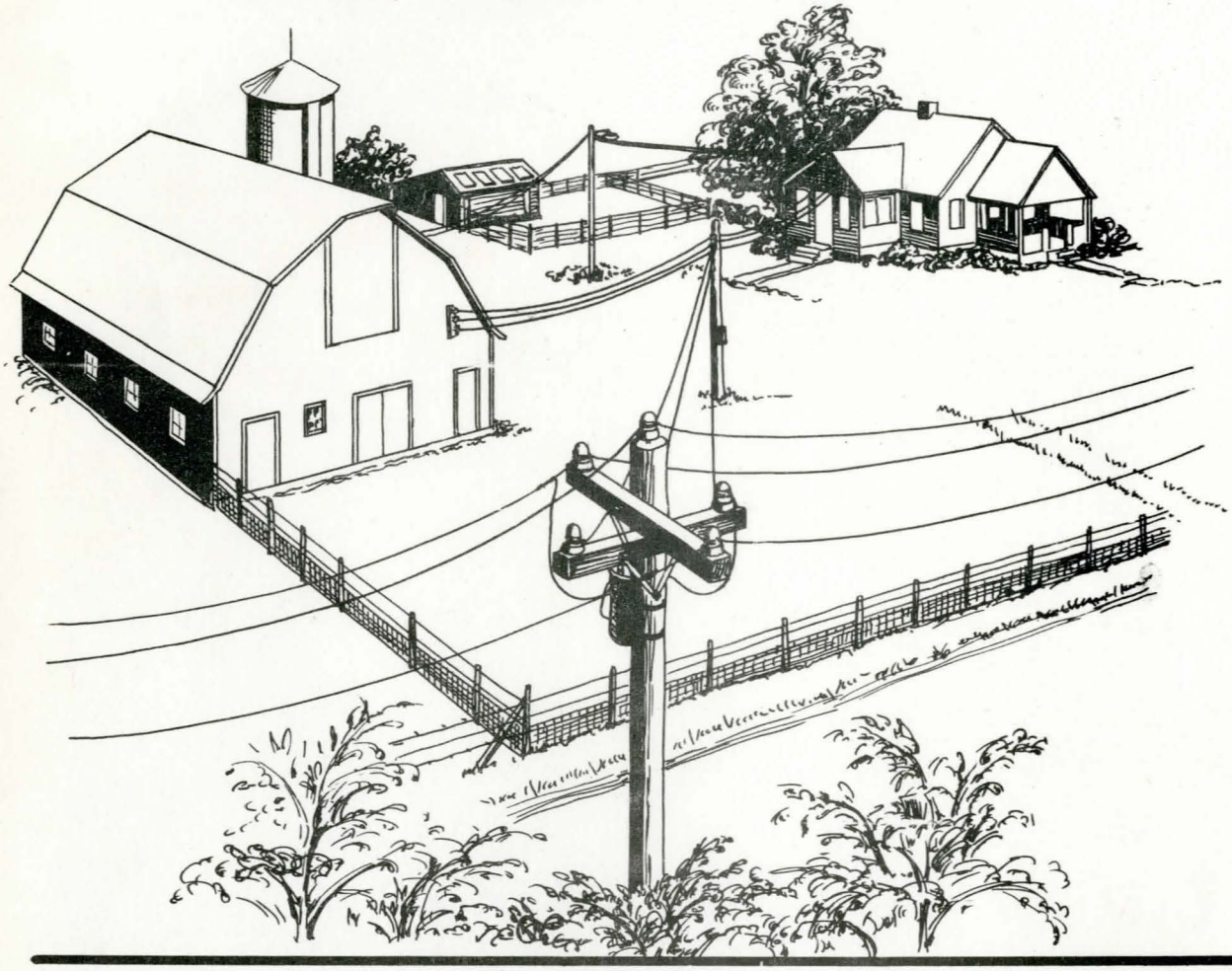
SUGGESTIONS FOR PREPARING TO USE ELECTRICITY ON YOUR FARM



EXTENSION SERVICE · AGRICULTURAL COLLEGE · UNIVERSITY OF NEBRASKA · LINCOLN
EXTENSION CIRCULAR · · 783

Revised by
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ASSISTANT EXTENSION AGRICULTURAL ENGINEER

APRIL 1947

SUGGESTIONS FOR PREPARING TO USE ELECTRICITY ON YOUR FARM

This circular is prepared for the purpose of making suggestions that will be helpful to the farm family which is faced with the pleasant but perplexing problem of using electricity for the first time. It is hoped that these suggestions will contribute to the fund of information necessary for the realization of the maximum benefits which electric service can provide.

No two farms are exactly alike, and no two farm families have identical desires. The selection, arrangement and use of electric appliances and equipment will vary greatly. For these reasons no specific outline can be followed in putting electricity to work on the farm and in the home. For the most part it will be necessary for each farm family to work out its own plan for the use of electric service. Careful planning is necessary if the greatest benefit is to be received from the investment made in electrical conveniences.

Importance of Making Plans to Use Electricity

Briefly listed below are some of the reasons why it is essential to have a definite plan for both present and future uses of electric service.

1. Starting without enough uses for electricity often discourages the rural user because he realizes no profit or tangible return. He becomes dissatisfied because the size of the service bill is considered rather than the amount of service that is being received.

2. A plan is necessary before the farm can be properly wired. Future plans must be considered along with present plans if expensive rewiring at some later time is to be avoided. This foresight is more important than many new users realize. Too often many dollars have been spent in remodeling inadequate wiring systems that could just as well have been installed properly in the first place at much less expense. On the other hand, there is no advantage in putting in wiring that will never be used. Careful planning saves money.

3. A farmer must study and plan before he can determine whether or not he can afford electric service. He will need to know the approximate costs of wiring, fixtures, appliances and equipment, and of the electricity he will use. He will want to compare older methods with new electrical methods as to savings in time and expense. He should consider the convenience, safety and cleanliness of electric service. He will not overlook the reduction of fire hazard. He will think of the better living conditions possible for his family. The farmer and his family should be the ones to decide about having electric service.

4. Planning makes possible saving and economy. The first saving is in well planned wiring. Another is in the purchase of good equipment. The average family is not able to buy at once everything it desires. The first items purchased should be those from which the greatest benefit will be derived. It is a good plan to buy well known makes through reliable local dealers who can be expected to be in business later on when service or repairs are needed. The use of cheap materials and equipment of inferior quality is false economy.

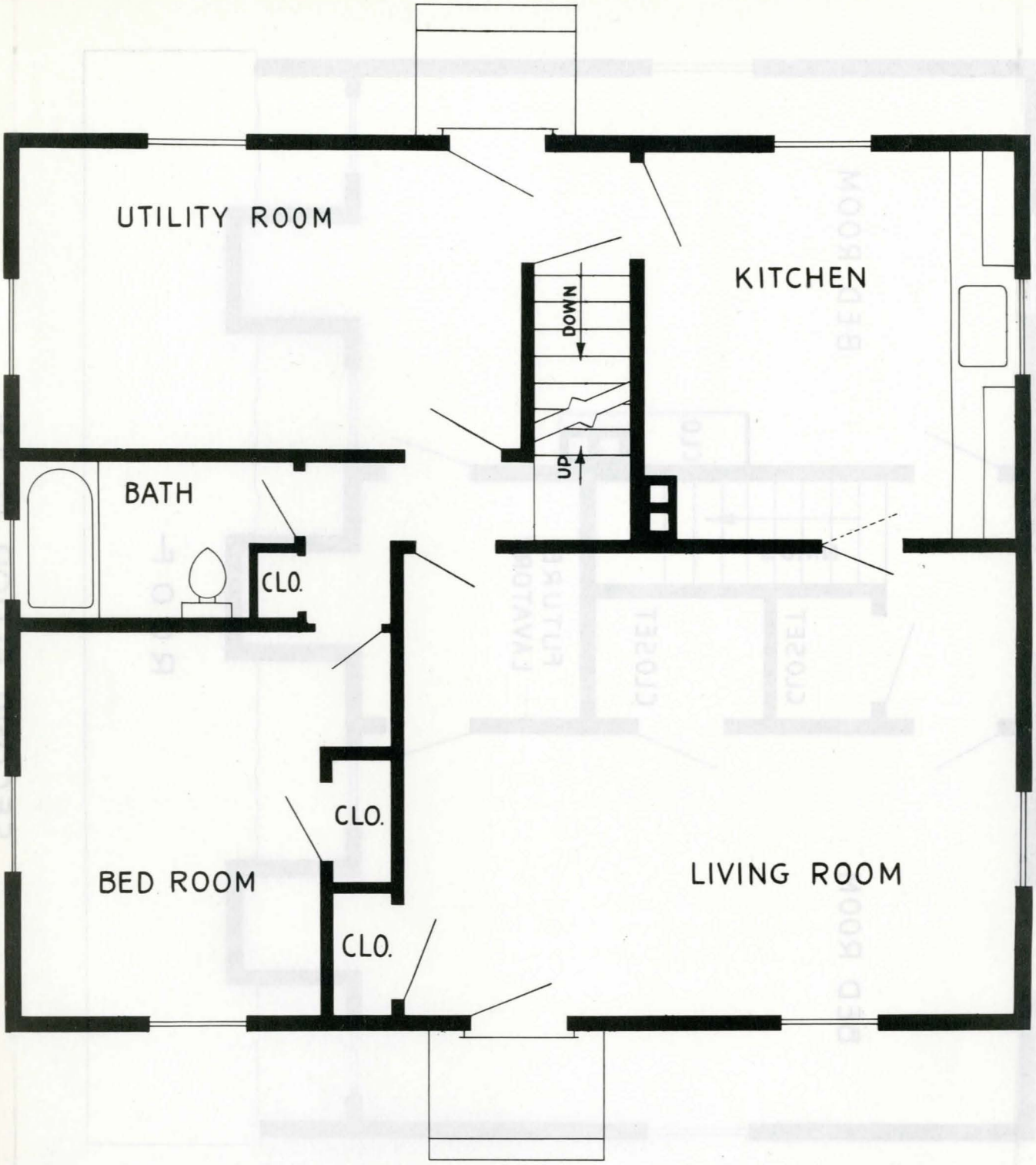
Suggestions for a Plan

1. **Draw Sketches.**

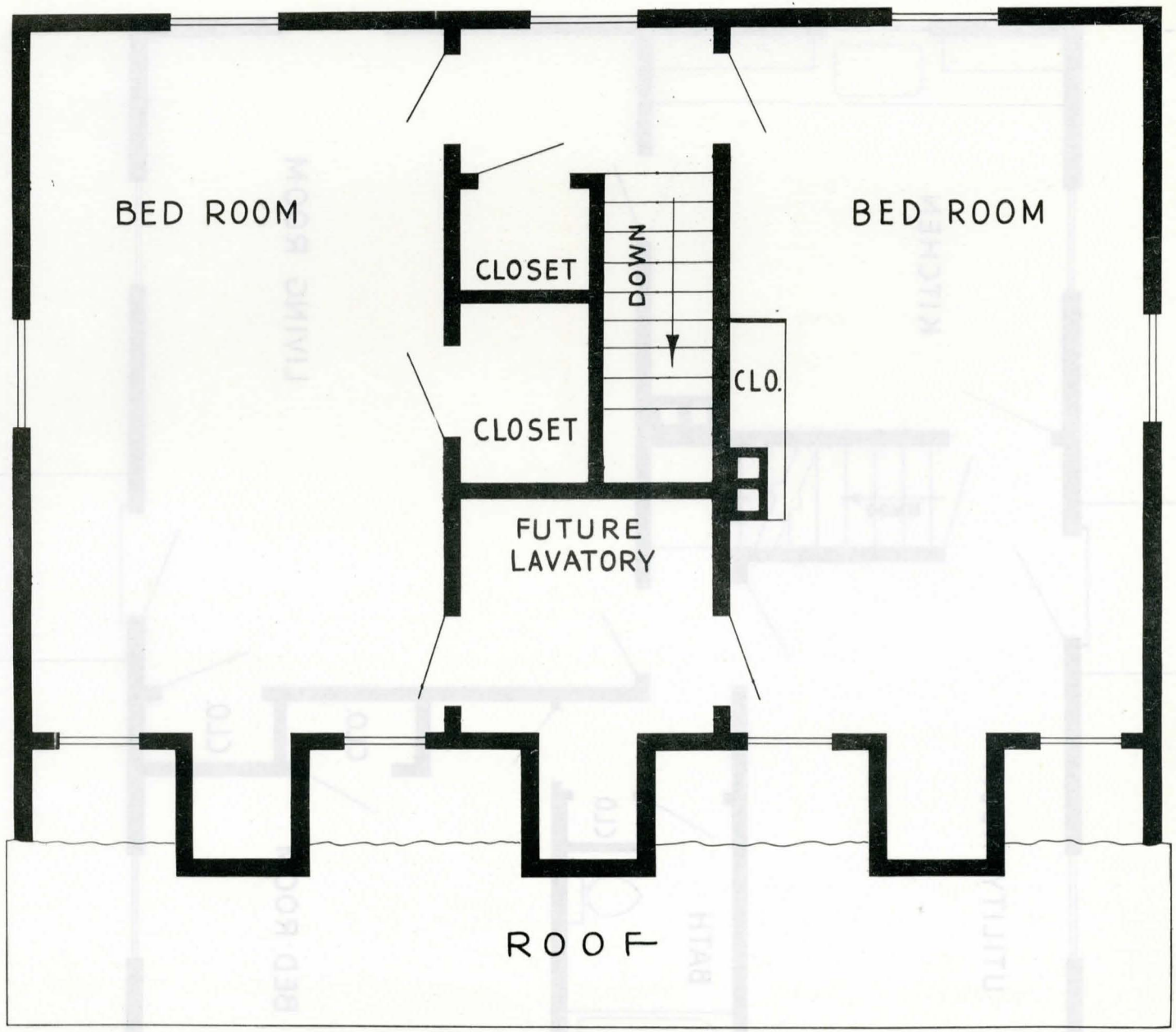
   A. Draw a sketch of the floor plan of each building to be wired showing the location of each room and all possible places that electricity is likely to be used. Make all sketches large enough so that wiring requirements can be shown clearly.

   Drawings of a house and barn and an outline of a farmstead have been included here to indicate how the sketches should be drawn. Refer to Figures 1, 2, 3, and 4 on the following pages. Wiring requirements can be inserted on these drawings as a practice exercise in laying out a wiring system before starting on your own drawings. Although only sketches of the house and barn are shown here, similar sketches should be drawn for every major building on your farm including granary, hog house, poultry house, shop, etc.

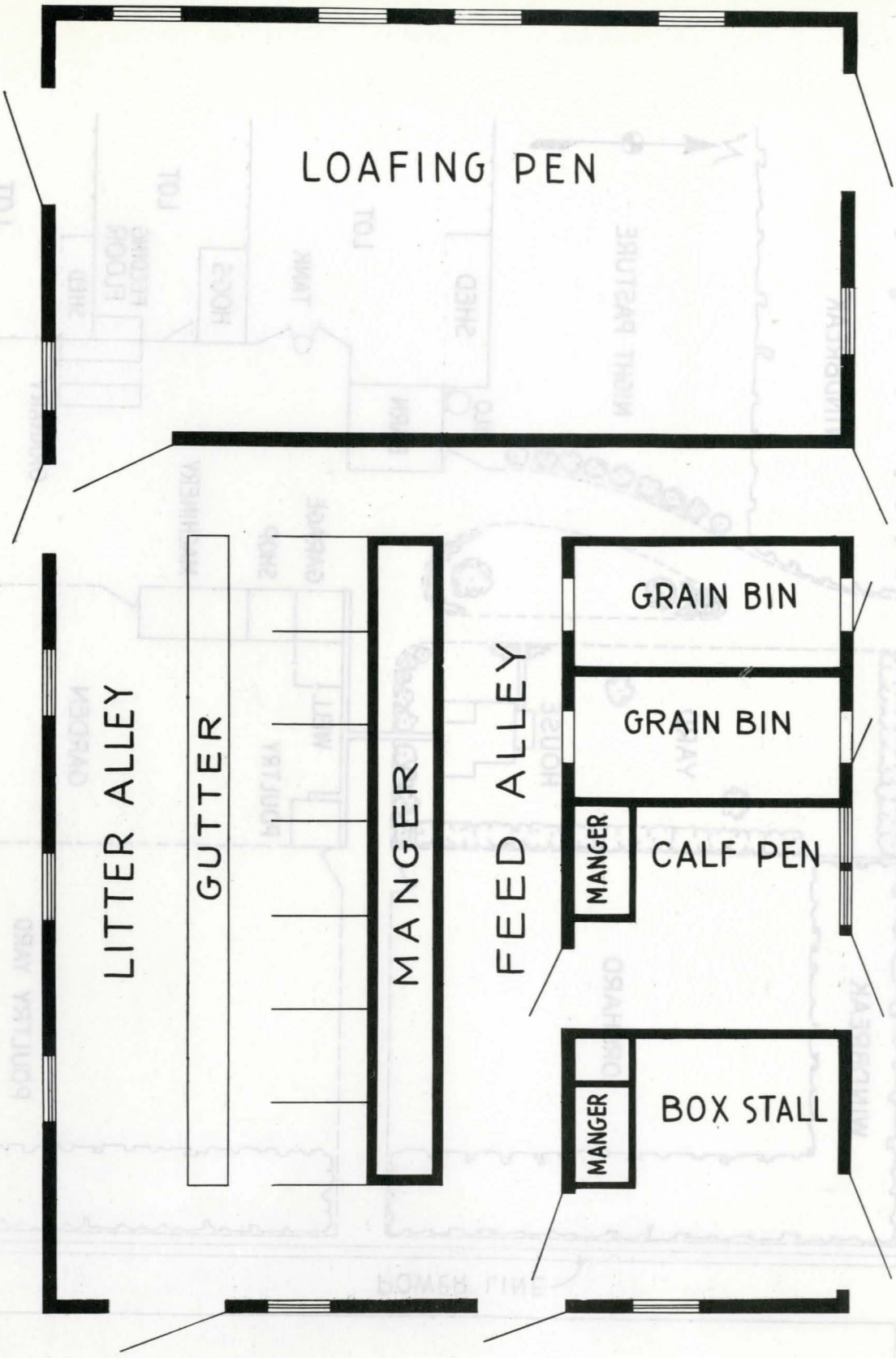
   B. Make sketch of farmstead showing location of all the buildings in relation to each other.



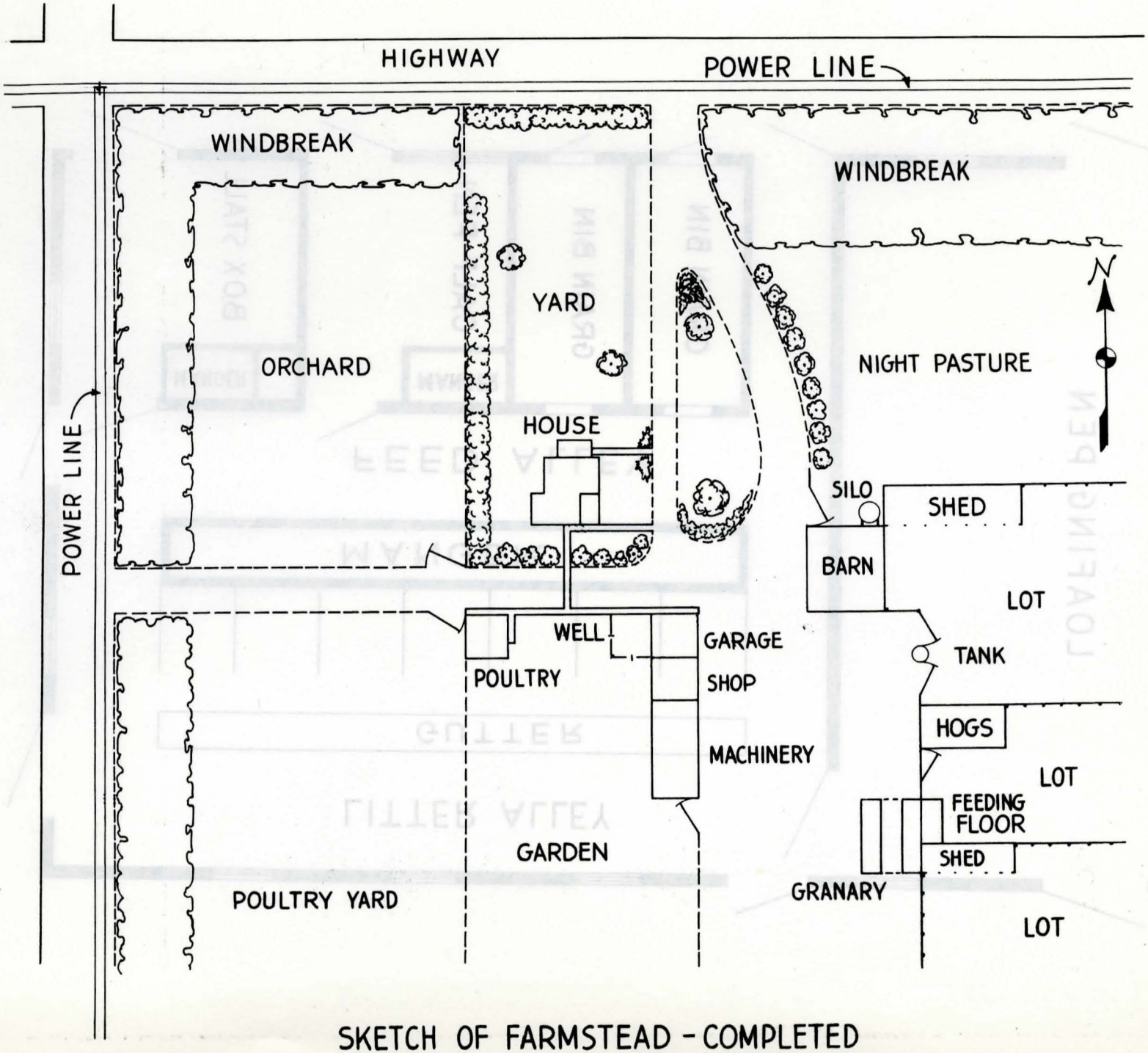
FIRST FLOOR PLAN



SECOND FLOOR PLAN



FLOOR PLAN - GENERAL PURPOSE BARN



SKETCH OF FARMSTEAD - COMPLETED

SUMMARY OF USES OF ELECTRICITY ON THE FARM

Equipment	Motor Required (H. P.)	Approximate Demand (Watts)	Time to Consume 1 kwh (Hours)	Estimated Energy Consumption: Per Month (kwh)	Estimated Energy Consumption: As shown below
Air Conditioner	¼ - 5	340 - 4900	2.9 - 0.2	*	
Apple Grader	¼ - 3	340 - 2900	2.9 - 0.3		½ to 1½ kwh per 100 bu.
Battery Charger	---	100 - 750	10.0 - 1.3	*	
Bone Grinder	5	4900	0.2	*	
Bottling & Capping (Dairy)	1/8-3/4	200 - 900	5.0 - 1.1		1 kwh per 1,000 bottles
Bottle Washer	1/8-3/4	200 - 900	5.0 - 1.1		¼ to ½ kwh per 1,000 bottles
Brooder	---	200 - 1000	5.0 - 1.0		½ to 1 kwh per 6 weeks
Burglar Alarm	---	10 - 60	100.0 - 16.7	*	
Casserole	---	100 - 600	10.0 - 1.7	*	
Chafing Dish	---	160 - 600	6.3 - 1.7	*	
Churn	1/16-½	100 - 600	10.0 - 1.7	1 - 3	
Cider Mill	½ - 5	600 - 4900	1.7 - 0.2		1 kwh per 10 bu. apples
Circular Saw (Shop)	1/6- ½	260 - 600	3.8 - 1.7	*	
Clock	---	2 - 10	500.0 - 100.0	1 - 8	
Coffee Maker	---	450 - 750	2.2 - 1.3	*	
Concrete Mixer	¼ - 5	340 - 4900	2.9 - 0.2		½ kwh per cubic yard
Corn Popper	---	200 - 660	5.0 - 1.5	*	
Corn Sheller	¼ - 5	340 - 4900	2.9 - 0.2		½ to 1 kwh per 5 bu. corn
Corn Shredder	5	4900	0.2		5 kwh per ton
Cream Separator	1/6-1/3	260 - 440	3.8 - 2.3		½ kwh per 1,000 lbs. milk
Curling Iron	---	12 - 250	83.3 - 4.0	*	
Dairy Equipment Sterilizer	---	1000 - 6000	1.0 - 0.2		3½ - 7½ kwh per day
Dishwasher	1/6-1/3	260 - 440	3.8 - 2.3	2 - 3	
Drill Press	1/8 - ½	200 - 600	5.0 - 1.7	1 - 5	
Egg Candler	---	50 - 100	20.0 - 10.0	*	
Egg Poacher	---	350 - 600	2.9 - 1.7	*	
Emery Wheel	1/8 - 1	200 - 1100	5.0 - 0.9	1 - 5	
Engine Heater	---	100 - 1000	10.0 - 1.0	*	
Ensilage Cutter	5	4900	0.2		1 - 1½ kwh per ton
Fan	---	40 - 340	25.0 - 2.9	*	
Fanning Mill	¼ - ½	340 - 600	2.9 - 1.7		½ - 2 kwh per 100 bu.
Feed Grinder	½ - 5	600 - 4900	1.7 - 0.2		3 - 20 kwh per ton

CHART NO. 1

Chart No. 1 (Con't.)

Equipment	Motor Required (H. P.)	Approximate Demand (Watts)	Time to Consume 1 kwh (Hours)	Estimated Energy Consumption: Per Month (kwh)	Estimated Energy Consumption: As shown below
Feed Mixer	¼ - 5	340 - 4900	2.9 - 0.2		½ - 2 kwh per 1,000 lbs.
Fence (Electric)	---			3 - 6	
Fly Electrocutor	---	50 - 250	20.0 - 4.0	*	
Food Chopper	---	100 - 500	10.0 - 2.0	*	
Food Mixer	---	100 - 500	10.0 - 2.0	*	
Forge Blower	1/10-¼	150 - 340	6.7 - 2.9	1 - 5	
Furnace Control	---	30 - 100	33.3 - 10.0	5 - 20	
Furnace Stoker	1/10-½	150 - 600	6.7 - 1.7	15 - 40	
Germicidal Lamp	---	4 - 30	250.0 - 33.3	*	
Grain Elevator	2 - 5	2000 - 4900	0.5 - 0.2		1 - 8 kwh per 1,000 bu.
Grain Grader & Cleaner	¼ - ½	340 - 600	2.9 - 1.7		½ to 2 kwh per 100 bu.
Grind Stone	¼ - 1/3	340 - 440	2.9 - 2.3	*	
Hair Dryer	---	35 - 550	28.5 - 1.8	*	
Hay Baler	5	4900	0.2		2 - 4 kwh per ton
Hay Hoist	3 - 5	2900 - 4900	0.3 - 0.2		1/3 kwh per ton
Heat Lamp (Infra red)	---	35 - 1500	28.5 - 0.7	*	
Heating Pad	---	35 - 150	28.5 - 6.7	*	
Hot Plate	---	500 - 2000	2.0 - 0.5	*	
Iron	---	550 - 1000	1.8 - 1.0	5 - 8	
Ironing Machine	---	1250 - 1500	0.8 - 0.7	8 - 10	
Irrigation (garden)	¼ - 5	340 - 4900	2.9 - 0.2		½ to 4 kwh per acre-foot per foot lift
Jig Saw	¼ - 1/3	340 - 440	2.9 - 2.3	*	
Juice Extractor	---	100 - 500	10.0 - 2.0	*	
Lathe	1/8 - 1	200 - 1100	5.0 - 0.9	*	
Lights (Household)	---	200 - 1000	5 - 1.0	15 - 30	
Lights (Yard & Barns)	---	100 - 500	10 - 2.0	10 - 15	
Milk Cooler	¼ - 5	340 - 4900	2.9 - 0.2		½ - 2 kwh per 10 gallons
Milking Machine	1/6 - 3	260 - 2900	3.8 - 0.3		1½ - 3 kwh per cow per month
Oil Burner	1/6-1/3	260 - 440	3.8 - 2.3	20 - 40	
Paint Sprayer	¼ - ½	340 - 600	2.9 - 1.7		1 kwh per 250 sq. ft.
Percolator	---	300 - 660	3.3 - 1.5	5 - 10	
Potato Grader	½ - 1	600 - 1100	1.7 - 0.9		1 - 2 kwh per 1,000 lbs.
Poultry Lighting	---	40 - 160	25.0 - 6.3		4 - 5 kwh per mo. per 100 hens
Poultry Water Warmer	---	50 - 700	20.0 - 1.4		1 - 2 kwh per day
Radio	---	45 - 150	22.2 - 6.7	3 - 15	
Range	---	5000 - 10,000	0.2 - 0.1		1 kwh per person per day
Razor	---	6 - 15	167.0 - 66.7	Under 1	

Chart No. 1 (Con't.)

Equipment	Motor Required (H. P.)	Approximate Demand (Watts)	Time to Consume 1 kwh (Hours)	Estimated Energy Consumption: Per Month (kwh)	Estimated Energy Consumption: As shown below
Razor Blade Sharpener	---	10 - 30	100.0 - 33.3	Under 1	
Refrigerator (Dairy)	¼ - 5	340 - 4900	2.9 - 0.2		3/4 - 1 kwh per 10 gal. per day
Refrigeration(Household)	---	200 - 440	5.0 - 2.3	10 - 50	
Roaster	---	800 - 1600	1.3 - 0.6	*	
Room Cooler	1/6-1/3	260 - 440	3.8 - 2.3	*	
Room Heater	---	550 - 1250	1.8 - 0.8	*	
Sandwich Grill	---	660 - 1000	1.5 - 1.0	*	
Sausage Grinder	1/16-½	100 - 600	10.0 - 1.7		4 kwh per 100 lb. meat
Sewing Machine	---	30 - 100	33.3 - 10.0	½ - 2	
Sheep Shearing	¼ - ½	340 - 600	2.9 - 1.7		1 - 2 kwh per 100 sheep
Soil Heating Cable (60' on 115v.)	---	400	2.5	*	
Soil Heating (hotbed 6'x6')	---	400	2.5		½ - 3 kwh per 3'x6' sash per day
Soldering Iron	---	60 - 500	16.7 - 2.0	*	
Sun lamp (Ultra violet)	---	60 - 500	16.7 - 2.0	*	
Tank Heater (Livestock)	---	400 - 1600	2.5 - 0.6	*	
Toaster	---	400 - 1200	2.5 - 0.8	5 - 15	
Vacuum Cleaner	---	100 - 340	10.0 - 2.9	½ - 2	
Vibrator	---	20 - 100	50.0 - 10.0	Under 1	
Waffle Iron	---	300 - 1320	3.3 - 0.8	*	
Washing Machine	1/6-1/3	260 - 440	3.8 - 2.3	2 - 6	
Water Heater (Dairy)	---	500 - 6000	2.0 - 0.2		15 - 35 kwh per 100 gal.milk
Water Heater (Household)	---	150 - 5000	6.7 - 0.2	100 - 600	2 - 4 kwh per person per day
Water System (Deep Well)	½ - 1	600 - 1100	1.7 - 0.9	20 - 40	
Water System (Shallow Well)	¼ - 1/3	340 - 440	2.9 - 2.3	5 - 15	
Welder	---	1000 - 5000	1.0 - 0.2	*	
Wood Saw	3 - 5	2900 - 4900	0.3 - 0.2		1 - 3 kwh per cord
Zero Storage Cabinet	¼ - ½	340 - 600	2.9 - 1.7	75 - 100	

* Data not shown because of wide variation in uses.

2. Plan Uses.

A. Study carefully the summary of uses of electricity on the farm given in Chart No. 1 on pages 7, 8, and 9 of this circular. With your sketches and this summary as a guide, make a list of all the electrical equipment that is likely to be used on your farm in the years to come. This list will be used as a guide for planning the wiring of your farmstead and, for that reason, care should be taken that all practical uses are listed. Even though some of the uses may have a remote possibility of ever being used, it is best to include them in this list. Make your list in the following manner.

Basement
- Air conditioning
- Freezing and storage cabinet
- Furnace stoker
- Lights
- Oil burner
- Washing machine
- Water heater
- Water system

Bath Room
- Curling iron
- Hair dryer
- Lights
- Razor
- Room heater
- Sun lamp
- Vibrator

Bed Rooms
- Air conditioning
- Blanket
- Clock
- Curling iron
- Fan
- Hair dryer
- Heat lamp
- Heating pad
- Lights
- Radio
- Sewing machine
- Vacuum cleaner

Dining Room
- Casserole
- Chafing dish
- Clock
- Fan
- Lights
- Radio
- Sandwich grill
- Toaster
- Vacuum cleaner
- Waffle iron

Hallways
- Lights
- Vacuum cleaner

Kitchen
- Casserole
- Chafing dish
- Churn
- Clock
- Coffee maker
- Corn popper
- Cream separator
- Dishwasher
- Egg poacher
- Fan
- Food chopper
- Lights
- Percolator
- Radio
- Range
- Refrigerator
- Roaster
- Room cooler
- Sandwich grill
- Toaster
- Waffle iron
- Zero storage cabinet

Living Room
- Air conditioning
- Clock
- Fan
- Lights
- Radio
- Room cooler
- Vacuum cleaner

Porch
- Churn
- Cream separator
- Fan
- Lights

Utility Room

- Cream separator
- Egg candler
- Fan
- Hot plate
- Iron
- Ironing machine
- Lights
- Radio
- Sausage grinder
- Washing machine
- Water heater

Barn

- Elevator
- Ensilage cutter
- Fan
- Feed grinder
- Feed mixer
- Fly electrocutor
- Hay hoist
- Lights
- Milking machine
- Paint sprayer
- Sheep shears
- Tank heater

Dairy Barn

- Bottling and capping
- Bottle washer
- Clippers
- Equipment sterilizer
- Ensilage cutter
- Fans - ventilating
- Feed grinder
- Feed mixer
- Fly electrocutor
- Germicidal lamp
- Grain elevator
- Hay hoist
- Heat lamp
- Immersion heater

Dairy Barn (Con't.)

- Lights
- Milking machine
- Milk cooler
- Refrigeration
- Tank warmer
- Water heater

Garage

- Engine heater
- Lights

Granary and Crib

- Burglar alarm
- Corn sheller
- Fanning mill
- Feed grinder
- Feed mixer
- Grain elevator
- Grain grader and cleaner
- Lights

Poultry and Brooder House

- Brooder
- Germicidal lamps
- Lights
- Water warmer
- Sun lamps

Shop

- Battery charger
- Circular saw
- Drill press
- Emery wheel
- Fan
- Forge blower
- Grind stone
- Jig saw
- Lathe
- Lights
- Soldering iron
- Welder

The above list of equipment suggests possible places of using different kinds of equipment, and can be used for checking your own list for completeness.

B. In outlining the uses of electricity on your farm, it would be well to seek the advice of someone familiar with wiring problems and general use of electricity. This advice could be secured from your County Agricultural Agent, an agricultural representative of the utility company supplying the service or a reliable and qualified electrical contractor. Discuss the various uses of electricity with this adviser and give his suggestions proper consideration.

C. Now refer to your sketches. Picture your family making use of each of the different pieces of equipment you have listed, and begin to plan the outlets that will best take care of the uses you and your family will have for that equipment. Mark plainly the location and type of each outlet with some kind of symbol as you go along. The symbols suggested below are not complicated and will be sufficient for your part of the wiring detail.

<u>Symbols for Indicating Outlets</u>

Ceiling Outlet - - - - - An accessible opening in a wiring system supplying electricity to a lighting fixture suspended from the ceiling.

Wall Bracket Outlet - - An accessible opening in a wiring system provided for supplying electricity to lighting fixtures hung on side walls.

Convenience Outlet - - - An accessible opening in a wiring system for supplying electricity for operating portable electric appliances such as radios, toasters, vacuum cleaners, floor lamps, etc.

Special Purpose Outlet - An opening provided for supplying electricity to major appliances and equipment such as ranges, water heaters, large motors or other special appliances. Such outlets are usually installed on individual circuits, and the use will determine the type and size of outlet. (Label each special outlet on sketch.)

S_1 Single Pole Switch - - - Switch used in a lighting fixture circuit when it is desired to turn the light on and off at one place.

S_3 Three Way Switch - - - - Switch necessary in controlling a light from two different places. Two such switches are necessary in one circuit.

S_4 Four Way Switch- - - - - Switch necessary in controlling a light from three or more places. Four-way switches are used in conjunction with three-way switches. Two three-way switches are used and as many four-way switches as there are additional places of control.

Suggestions for minimum outlet requirements are given in Chart No. 2 on page 18. Figures 5, 6, and 7 on the following pages indicate how your sketches should look when you are ready to ask a wireman what your wiring is going to cost.

D. Designate on the farmstead sketch where the center of distribution should be and show desired location of service wires, taking into consideration accessibility from main line, appearance of farmstead and center of future load. See Figure 8. If underground service wires are desired, this should be noted and planned for.

3. Plan the Wiring.

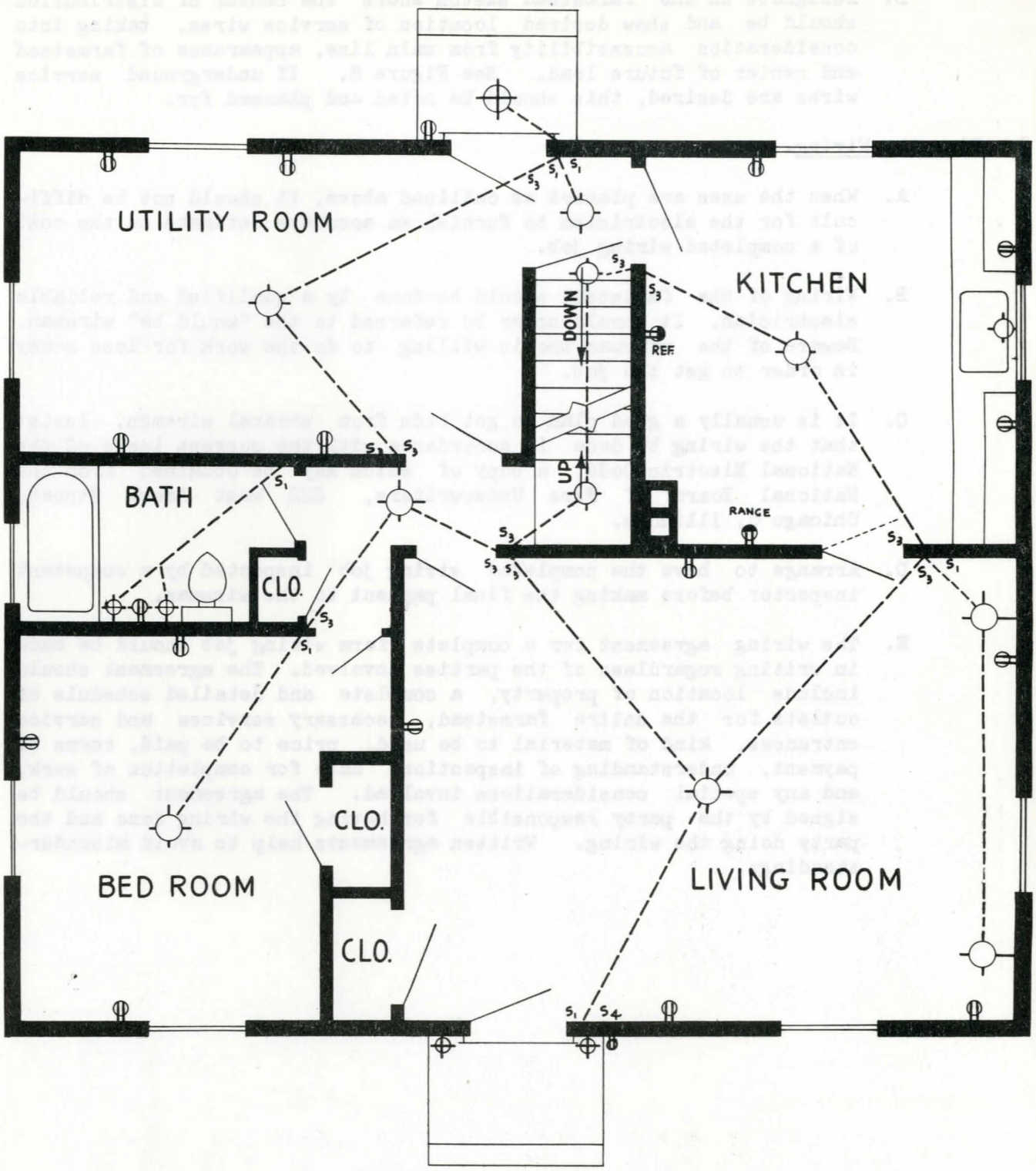
A. When the uses are planned as outlined above, it should not be difficult for the electrician to furnish an accurate estimate on the cost of a completed wiring job.

B. Wiring of the farmstead should be done by a qualified and reliable electrician. It should never be referred to the "would be" wireman. Beware of the wireman who is willing to do the work for less money in order to get the job.

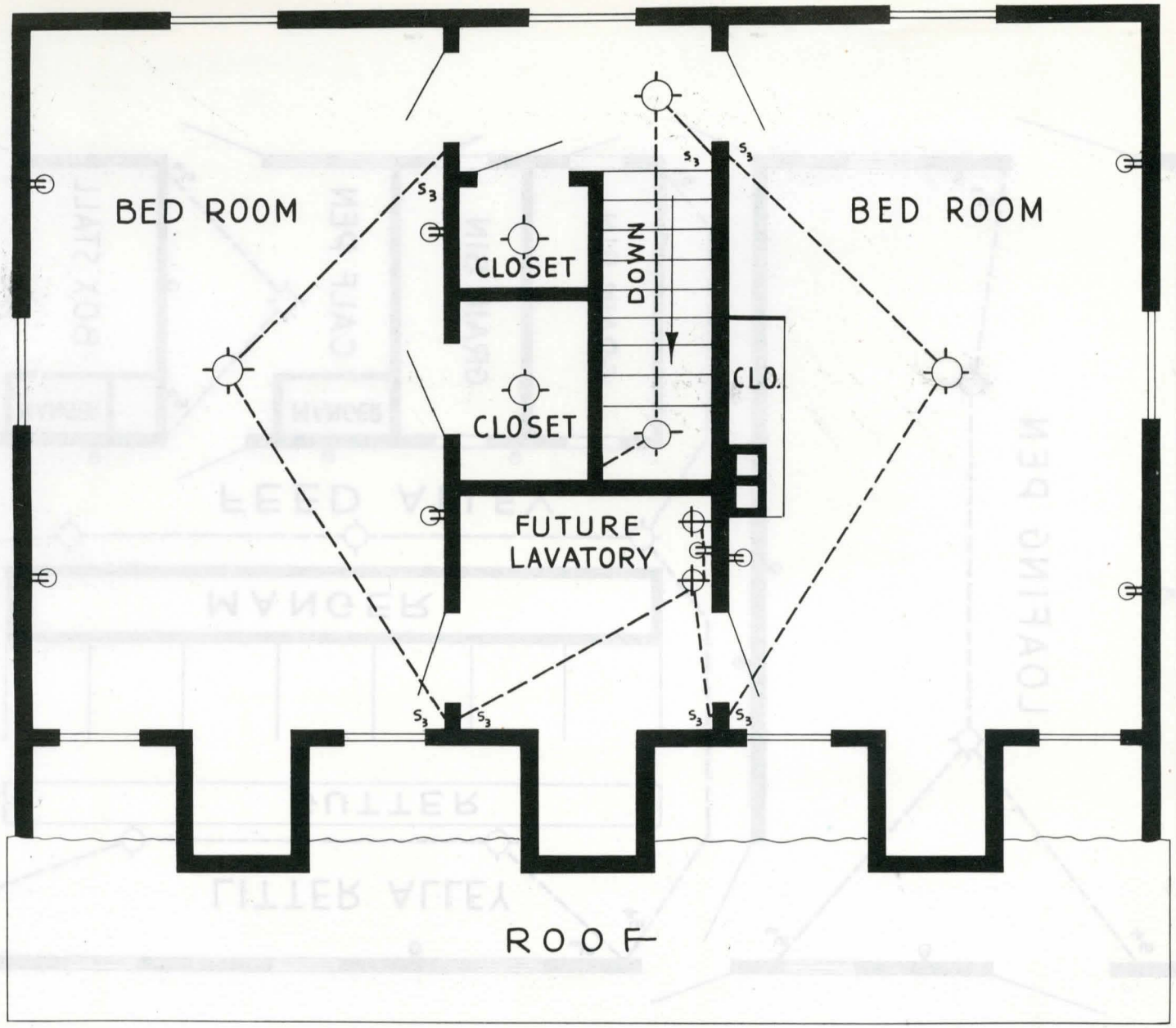
C. It is usually a good plan to get bids from several wiremen. Insist that the wiring be done in accordance with the current issue of the National Electric Code, a copy of which may be obtained from the National Board of Fire Underwriters, 222 West Adams Street, Chicago 6, Illinois.

D. Arrange to have the completed wiring job inspected by a competant inspector before making the final payment to the wireman.

E. The wiring agreement for a complete farm wiring job should be made in writing regardless of the parties involved. The agreement should include location of property, a complete and detailed schedule of outlets for the entire farmstead, necessary services and service entrances, kind of material to be used, price to be paid, terms of payment, understanding of inspection, date for completion of work, and any special considerations involved. The agreement should be signed by the party responsible for having the wiring done and the party doing the wiring. Written agreements help to avoid misunderstandings.



FIRST FLOOR PLAN



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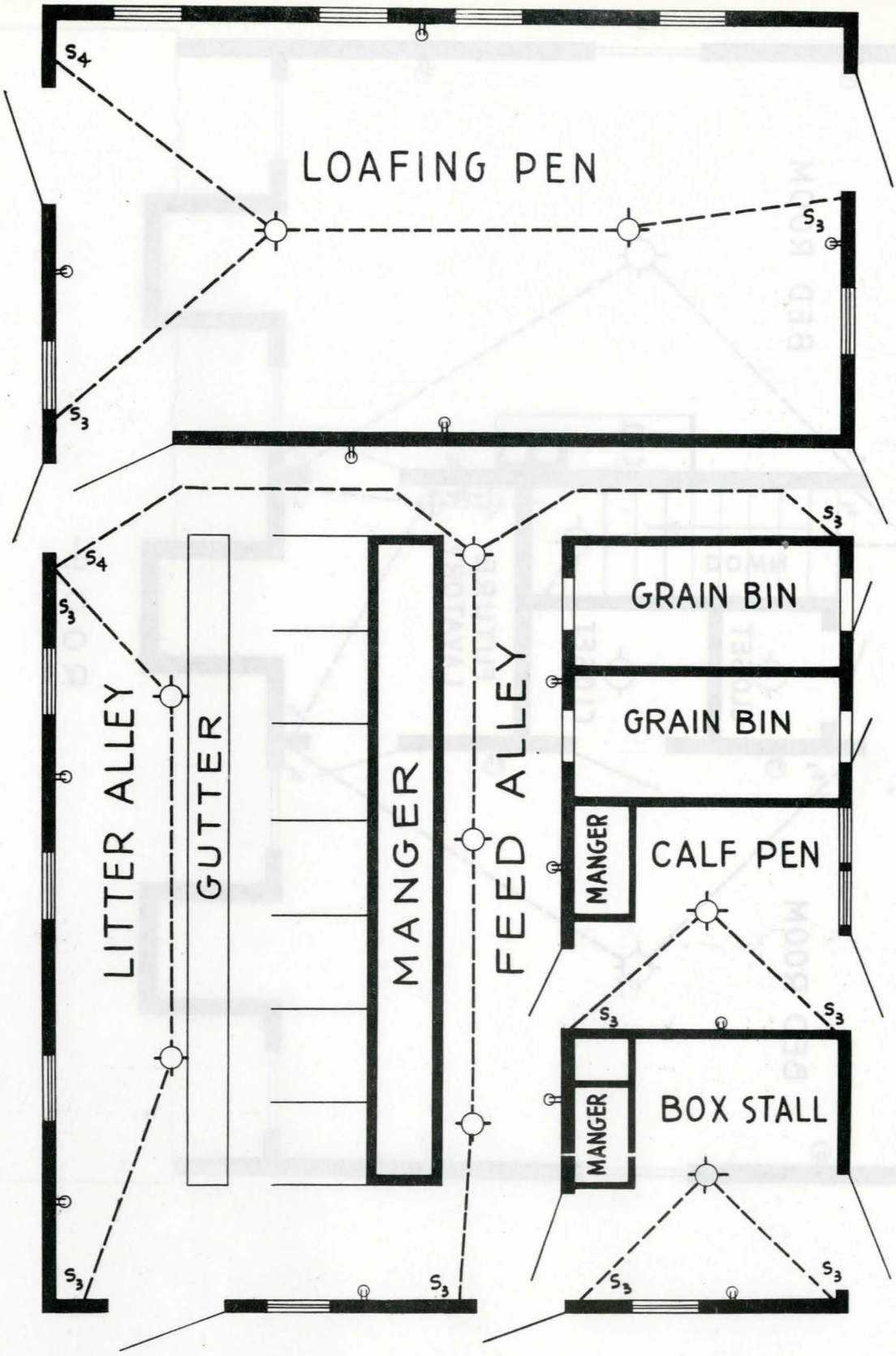
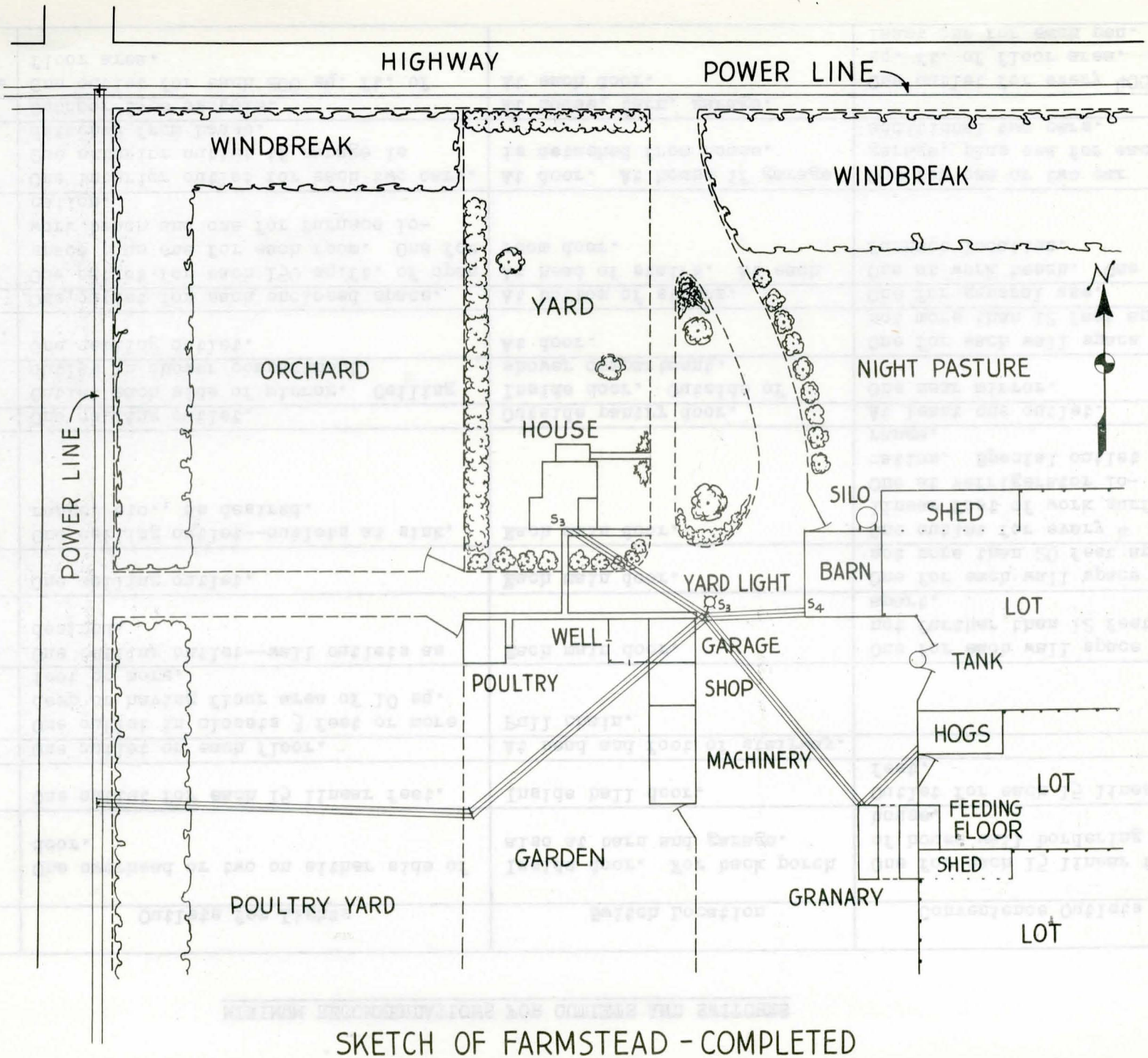


FLOOR PLAN - GENERAL PURPOSE BARN



SKETCH OF FARMSTEAD - COMPLETED

MINIMUM RECOMMENDATIONS FOR OUTLETS AND SWITCHES

Place	Outlets for Lights	Switch Location	Convenience Outlets
Porches	One overhead or two on either side of door.	Inside door. For back porch also at barn and garage.	One for each 15 linear feet of house wall bordering house.
Halls	One outlet for each 15 linear feet.	Inside hall door.	Outlet for each 15 linear feet.
Stairways	One outlet on each floor.	At head and foot of stairway.	
Closets	One outlet in closets 3 feet or more deep or having floor area of 10 sq. feet or more.	Pull chain.	
Living Room	One ceiling outlet--wall outlets as desired.	Each main door.	One for each wall space but not further than 12 feet apart.
Dining Room	One ceiling outlet.	Each main door.	One for each wall space but not more than 20 feet apart.
Kitchen	One ceiling outlet--outlets at sink, range, etc., as desired.	Each main door.	One outlet for every 4 linear foot of work surface. One at refrigerator location. Special outlet for range.
Pantry	One ceiling outlet.	Outside pantry door.	At least one outlet.
Bathroom	Outlet each side of mirror. Ceiling outlet in shower compartment.	Inside door. Outside of shower compartment.	One near mirror.
Bedroom	One ceiling outlet.	At door.	One for each wall space but not more than 12 feet apart.
Attic	One outlet for each enclosed space.	At bottom of stairs.	One for general use.
Basement	One outlet for each 150 sq.ft. of open space plus one for each room. One for work bench and one for furnace location.	At head of stairs. At each room door.	One at work bench. One at furnace location.
Garage	One interior outlet for each two cars. One exterior outlet if garage is detached from house.	At door. At house if garage is detached from house.	One for one or two car garage, plus one for each additional two cars.
Yard Light	Outdoor type on pole.	At house, barn, garage.	
Poultry House	One outlet for each 200 sq. ft. of floor area.	At each door.	One outlet for every 400 sq. ft. of floor area. At least one for each pen.

MINIMUM RECOMMENDATIONS FOR OUTLETS AND SWITCHES (Con't.)

Place	Outlets for Lights	Switch Location	Convenience Outlets
Brooder House (Portable or Individual Type)	One ceiling outlet.	At door.	One ceiling outlet.
Brooder House (Colony Type)	One outlet for each brooder pen.	At doors.	One ceiling outlet for each brooder.
Dairy Barn	Litter Alley--One outlet every 12 feet on center line of alley. Feed Alley--One outlet every 20 feet on center line of alley.	At each door. Separate switches for each alley.	One every 20 feet.
Silo	One in top of silo well.	At entrance.	Special purpose outlet for ensilage cutter.
Granary	Ceiling outlet.	At each entrance.	At least two outlets. As many special purpose outlets as needed for special equipment such as grinders, elevators, feed mixers, etc.
Haymow or Hayloft	At least one outlet.	At most convenient location, usually at entrance.	Special purpose outlets for hay hoist and hay dryer.
General Purpose Barn	Outlet every 20 feet of feeding alleys. Outlet every 12 ft. of litter alleys. One in each separate pen or stall.	At each door. Separate switches for each alley. At gates.	One every 20 ft. in alleys. At least one in each pen. Special purpose outlets for hay hoist, grinder and other equipment.
Shop	One outlet for every 10 feet of bench length. One outlet for each permanently placed piece of equipment.	At each door. Conveniently located for each piece of equipment.	One outlet for each 10 feet of bench length. One outlet for each piece of permanent, power driven equipment less than $\frac{1}{2}$ hp. Special outlets for motor driven equipment $\frac{1}{2}$ hp. or more. Check with Power Company concerning welders.
Machine Shed	One outlet for every 400 sq.ft.	At entrances.	One outlet for every 800 sq. ft. of floor space.
Pump House	One outlet.	At door.	One outlet. Pump wired in.

4. Plan the Cost.

A. The cost of electricity from central station lines for the farm involves the cost of wiring the farm, the cost of the equipment and the cost of operating the equipment. Occasionally it is necessary for the farm owner to pay part of the cost of the line extension. If this is the case, the amount involved must, of course, be included in the cost figures.

B. Cost of Wiring.

There is a minimum amount of wiring that should be installed, and it is unwise to try to go below this amount. The difference in cost between a good wiring job and a cheap wiring job is so small it will soon be accounted for either in current savings, added convenience or the cost of revamping a wiring system. For the most part, the judgment of one or more reliable and qualified electricians should be accepted in determining the cost of wiring.

C. Cost of Equipment.

In considering the cost of equipment, the farm family should plan to buy equipment in the order in which they feel they will realize the most benefit. Here the problem of choosing between price and quality presents itself. Inferior quality equipment may be purchased or good quality equipment may be purchased. Ordinarily, equipment of good quality sells for more money than equipment of inferior quality. This statement should not be taken to mean that all high priced equipment is the equipment to buy. It does mean that care must be exercised in selecting the equipment to be used.

The safest method of buying electrical equipment is to buy standard, tested and proved equipment that is made by a reputable manufacturer and sold by a reliable dealer. For additional security, seek the advice of a non-interested party capable of judging the merits of electrical equipment.

D. Cost of Operating Equipment.

A plan for using electricity on the farm is not complete until the operating cost is known. Electricity will replace many present methods of doing work on the farm, and these present methods involve certain costs. The actual cost of using electricity will be the difference between the cost of present methods and the cost of doing the same work with electricity.

Chart No. 5 on page 23 can be used as a guide in estimating present costs if these costs are not known.

Chart No. 6 on page 24 suggests a method for estimating the cost of using electricity.

Example for Figuring Cost of Using Electricity

Consider the lights to be used on your farm. Referring to column 3 of Chart No. 1 on pages 7, 8, and 9, if your farm is an average farm you will probably use in the neighborhood of 360 kilowatt hours each year or thirty kilowatt hours per month for lighting. If the farm is large and the family is large and inclined to use a great deal of light, the monthly consumption for lights may be 50 or more kilowatt hours. By inserting these figures on a form similar to the one on page 25, and proceeding in a similar manner for all the probable uses that you have listed, it is possible to determine the approximate cost of using electricity. Such an analysis will also disclose the cost of each use.

USE	Average Yearly kwh Consumption	Power Required (Watts)	Voltage Required
FARM:			
Battery Charger	60	100 - 750	115 - 230
Bottle Washer	15	200 - 900	115 - 230
Chicken Brooder	250 (500 chicks)	200 - 450	115
Chore Motors:			
Stationary 2-3-5 H.P.		2000 - 4900	230
Portable 3-5 H.P.	(See Chart No. 4)	2900 - 4900	230
Churn	12	100 - 600	115
Cream Separator	25	260 - 440	115
Farm Shop	36	260 - 2000	115 - 230
Incubator	150 (500 chicks)	250 - 400	115
Lighting Fixtures	360	300 - 2500	115
Milk Cooler	720	340 - 4900	115 - 230
Milking Machine (Portable)	96	260 - 440	115
Refrigeration (Dairy)	1000	340 - 4900	115 - 230
Sausage Grinder	5	100 - 600	115
Sheep Shears	5 (200 sheep)	340 - 600	115
Soil Heating	60	400 (2 frames)	115
Tank Heater	250	400 - 1600	115
Water System (Entire farm)	150	340 - 1100	115 - 230
HOME:			
Clocks	24	2 - 10	115
Dishwasher	28	260 - 440	115
Fans	75	40 - 340	115
Heating Pad	36	35 - 150	115
Iron	84	550 - 1000	115
Ironing Machine	108	1250 - 1500	115
Oil Furnace	300	260 - 440	115
Radio	120	45 - 150	115
Range	1500	5000 - 10,000	115 - 230
Refrigerator	500	200 - 440	115
Sewing Machine	10	30 - 100	115
Small Appliances	150	300 - 1200	115
Vacuum Cleaner	18	100 - 340	115
Washing Machine	48	260 - 440	115
Water Heater	2500	150 - 5000	230

CHART NO. 3

This chart is included in this circular to serve as a guide for selecting electrical equipment for an ordinary farm.

Column 1 suggests some of the more common uses of electricity on farms.

Column 2 shows the average yearly kilowatt consumption to be expected from ordinary use of the respective equipment. This data can be used in figuring probable operating costs.

Column 3 lists the range of power required to operate the various kinds of equipment. This information must be taken into consideration in planning a wiring system.

Column 4 shows the voltage at which each kind of equipment is usually operated.

FARM EQUIPMENT
ADAPTED TO PORTABLE ELECTRIC MOTORS

Machine	Range of Size of Motor Required	Average kwh Consumption
Concrete mixer	1/4 - 5 H. P.	½ kwh per cu. yd.
Corn sheller (1-2 holes)	1/4 - 2 H. P.	1 kwh for 5 bu.
Shredder (4-8 rolls)	5 - 25 H. P.	5 kwh per ton
Grain elevators	2 - 7½ H. P.	3 kwh per 1,000 bu.
Ensilage cutters	5 - 40 H. P.	1 kwh per ton
Fanning mills	1/4 - 7½ H. P.	1 kwh per 100 bu.
Feed grinders:		
Burr-stone type	3 - 30 H. P.	1/10 to 3 kwh per 100 lbs.
Burr type	1/4 - 25 H. P.	Feed ground depending on
Hammer type	1 - 200 H. P.	fineness, kind of feed and machinery.
Feed mixers	1/4 - 7½ H. P.	1 kwh per ton
Hay hoists	3 - 10 H. P.	1 kwh for 3 tons
Hay baler	5 - 15 H. P.	3 kwh per ton
Wood saw	3 - 5 H. P.	1 to 2½ kwh per cord
Irrigation (surface)	5 - 125 H. P.	3 kwh per acre foot

CHART NO. 4

Chart No. 4 is inserted as a supplement to the preceding chart. It suggests some common uses for electric motors, the sizes of motors required to do the work, different kinds of work. The chart indicates very wide range of motor sizes for some of the work. This is included to emphasize the necessity of careful selection of equipment. Use of motors larger than 5 H. P. should not be anticipated for farm use unless special arrangements are made with a representative of the power source for using them.

ESTIMATING COST OF PRESENT METHODS

Items	Fuel, oil, etc. used per month	Cost per Month
Lamps and Lanterns	Kerosene and gasoline	$ 1.25
Battery radio	Charging battery	.75
Washing Machine	2 gals. gasoline @ 22 cents	.44
Windmill and Water Supply Tank	Maintenance and oil	.54
Brooding chickens	Kerosene	1.00
Ice Box	750 lbs. @ 50 cents per 100 lbs.	3.75
Grinding feed	2 tons custom grinding @ $2.00	5.00
Range (gasoline)	10 gal. gasoline @ 22 cents	2.20
	TOTAL MONTHLY COST	$14.93

CHART NO. 5

ESTIMATING AVERAGE MONTHLY COST OF ELECTRICITY
FOR A FARM

Use	1st Block 50 kwh 3.50	2nd Block 50 kwh 5 cts.	3rd Block 100 kwh 2½ cts.	4th Block All over 200 kwh 1-3/4 cts.	Cost of Each Use
Lighting Entire Farm	40				
Radio	10				$3.50
Washing Machine		3			.12
Iron		6			.24
Water System		13			.52
Small Appliances		12			.48
Chicken Brooder		16	4		.74
Cream Separator			2		.05
Farm Shop			4		.10
Refrigerator			40		1.00
Feed Grinder			34		.85
Electric Clocks			4		.10
Range			12	118	2.07

TOTAL COST OF CURRENT $ 9.77

CHART NO. 6

Because of the investment necessary to provide power facilities, the cost of the first kilowatt hours delivered to a service connection is comparatively high. As more electricity is used under the same conditions of demand, the cost per kilowatt hour gradually decreases. Electric rates are generally set up on this basis. In checking electric rates with the utility supplying your service, you will more than likely find the rate divided into blocks or steps. The first block or step comes at a comparatively high price per kilowatt hour, the next block comes at a lower price per kilowatt hour and so on until the lowest price per kilowatt hour is reached. Consequently, greater use of electricity automatically reduces the cost of electricity on a unit basis.

The rate used in the above example is a typical rural rate in Nebraska and serves as a good illustration for power costs.

A SPECIFIC PLAN

Use	1st Block	2nd Block	3rd Block	4th Block	Cost of each use

SUMMARY

Cost of Line Extension _____

Cost of Wiring Farmstead _____

Probable cost of electrical equipment:

(List equipment and cost below)

1. Lighting Fixtures _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

TOTAL _____

INITIAL INVESTMENT CONTEMPLATED _____

SALVAGE VALUE OF PRESENT EQUIPMENT _____

Monthly cost of doing work by present methods _____

Estimated monthly cost of doing work with electricity _____

Difference in favor of _____ per mo.

_____ per yr.

Cooperative Extension Work in Agriculture and Home Economics University of Nebraska College of Agriculture, and the United States Department of Agriculture cooperating, W. H. Brokaw, Director, Lincoln.