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THE COST OF RURAL ELECTRIC SERVICE

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SAMPLE CONTRACT FOR WIRING AND FIXTURES[1]

Place .....
Date .....

To: ..... From: .....
(owner) (contractor)
....

We hereby propose to furnish labor and material necessary to install wiring, sw... and fixtures at the farm owned by you, located ..... The work ... done under this contract will consist of wiring .....outlets for .....lights; ..... for single or double pole switches; and .....outlets for 3-way switches, and furni... hanging and connecting fixtures and .....convenience outlets, as follows:

Location	Outlets					Fixtures	
	Light		Switch				
	Ceiling	Bracket	Single	3-Way	Convenience	Number	P...
Porch							
Hall							
Stairs							
Living room							
Dining room							
Kitchen							
Furnace room ..							
Basement							
Storeroom							
Upper hall							
Bedroom							
Bedroom							
Bedroom							
Bath							
Attic							
.....							
.....							

Service to be .....

The total price of the work, complete as specified, is ..... d...
($.....), made up as follows:

Wiring to outlets only . . . . . $.....
Switches, plates, bodies, cords, etc. . . . . $.....
Fixtures . . . . . $.....
Additional for . . . . . $.....
Total . . . . . $.....

and we agree to accept payment of said sum of $....., payable as follow...
.....
.....
.....

Accepted: ..... Signed: .....
(owner) (contractor)

[1]Taken from University of Illinois multigraphed Extension Circular. A. Eng-56. "Farm Wirin...

Circular No. 305

The Cost of Rural Electric Service

By JAMES B. KELLEY and EARL G. WELCH

HOW TO ESTIMATE THE COST OF USING ELECTRICAL POWER

The kilowatt-hour (Kw. Hr.) is the unit of measure by which electricity is purchased just as a bushel is the unit for measuring wheat and corn. For example, a 100-watt light bulb operating for 10 hours uses a kilowatt-hour of electrical energy. The number of hours an appliance may operate on 1 kilowatt-hour of current is determined by dividing the number of watts required to operate it into 1000. A 500-watt flatiron will operate 2 hours (1000 ÷ 500 = 2) on 1 kilowatt of electrical energy. The electricity used is recorded by an instrument known as an electric watt-hour meter.

To estimate the cost of using electricity, proceed as follows:

1. Make a list of the amount of current required by the appliances to be used. The probable consumption in kilowatt hours per month of each appliance may be taken from Tables 1 and 2.

Lights	25 Kw. Hrs. per month
Iron	5 Kw. Hrs. per month
Radio	8 Kw. Hrs. per month
Vacuum cleaner	3 Kw. Hrs. per month
Shallow-well pump	9 Kw. Hrs. per month
Refrigerator	50 Kw. Hrs. per month
Range	150 Kw. Hrs. per month
Total	250 Kw. Hrs. per month

2. Set down the rate schedule taken from your contract with the utility company. The rate schedule below is assumed merely for illustration.

Rate Schedule from Contract

1st	—	20 Kw. Hrs. at	10	cts. per Kw. Hr.
Next	—	30 Kw. Hrs. at	5	cts. per Kw. Hr.
Next	—	50 Kw. Hrs. at	3	cts. per Kw. Hr.
Next	—	100 Kw. Hrs. at	2.5	cts. per Kw. Hr.
All over		200 Kw. Hrs. at	2	cts. per Kw. Hr.

3. Prepare a table of the appliances, rate schedule, and current consumption of each in the following form. Then make the cost calculations from your contract with the utility company as in the following table which is based on the above assumed rate.

Estimate of the Monthly Cost

Appliance	Kw. Hrs. Per Mo.	20 Kw. Hrs. @.10	30 Kw. Hrs. @.05	50 Kw. Hrs. @.03	100 Kw. Hrs. @.025	Over 200 Kw. Hrs. @.02	Cost	Sub-total
Lights	25	20@.10					$2.00	
			5@.05				.25	
Iron	5		5@.05				.25	
Radio	8		8@.05				.40	
Vacuum cleaner	3		3@.05				.15	
Shallow-well pump	9		9@.05				.45	3.50
			30					
Refrigerator	50			50@.03			1.50	5.00
Range	150				100@.025		2.50	7.50
						50@.02	1.00	8.50
	250					Total	8.50	

From the information given in the table, "Estimate of the Monthly Cost," note that the monthly bill for any farm depends upon the rates and the total amount of electricity used. The average cost of electricity per kilowatt-hour decreases as the quantity used increases. For example, if the customer uses only 20 kilowatt-hours for lights, the rate is 10 cents per Kw. Hr. If lights, an iron, a radio, a vacuum cleaner and shallow well pump are operated, the total consumption of 50 kilowatt-hours for the month will cost $3.50 and the average rate will be 7 cents per Kw. Hr. Also note that by adding a refrigerator and electric range, the total consumption of current increases to 250 Kw. Hrs. and the monthly bill increases to $8.50, but the average rate per kilowatt-hour decreases to 3.67 cents under the rate schedule assumed.

THE COST OF ELECTRICAL EQUIPMENT AND APPROXIMATE CURRENT CONSUMED

Table 1 contains a list of electrical appliances for the farm home with approximate price and kilowatt-hour consumption of each. Table 2 contains a list of electric equipment used on the farm outside the home and data regarding horsepower requirement and current consumption of each per unit of capacity. The data should be helpful in considering the purchase of such equipment. Altho the amount of electricity required for operating any machine varies with the conditions under which it is operated, the prospective purchaser may estimate the approximate cost of current for operating each device by multiplying the kilowatt-hour consumption figures given by the local rate charged for electricity, as illustrated in the preceding table.

Table 1. Approximate purchase prices and current consumption in kilowatt-hours of electrical appliances for the farm home.

Appliance or machine	Approximate price range	Approximate consumption in kilowatt-hours
Dishwasher	$160.00 to $325.00	2¼ per month
Fan	3.50 to 32.00	1 for each 8 to 10 hours
Iron	3.00 to 9.00	1 per person per month
Ironing machine	50.00 to 95.00	8 to 10 per month per family
Lighting home		25 per month (including small household appliances)
Oil furnace (electric control)		200 to 500 per year
Radio—All electric	15.00 to 275.00	3½ to 12 (average 8) per month
Battery charger		3½ to 5 per month
Range	60.00 to 325.00	30 per person per month
Refrigerator	85.00 to 350.00	30 to 50 per month
Sewing machine	35.00 to 100.00	1 or less per month
Electric clock	3.00 up	2 per month
Vacuum cleaner	15.50 to 65.00	1 to 3 per month
Washing machine	50.00 to 125.00	⅓ per person per month
Water heater	55.00 to 331.00	150 to 600 per month
Water supply	40.00 to 125.00	
Shallow well or cistern		1 to 1.5 per 1000 gallons pumped
Deep well		1.5 to 2.0 per 1000 gallons pumped.

NOTE: Data in Tables 1 and 2 were obtained from the following sources:
"Rural Electrification," by J. P. Schaenzer.
"Description Data 3190," Westinghouse Electric and Manufacturing Company.
"The Cost of Operating Electric Farm and Home Equipment," General Electric Company.
"Wired Help For Farm and Home," Westinghouse Electric and Manufacturing Company.
"Electricity On The Farm," C. R. E. A. Bul. Vol. VII, No. 3.

Table 2. Power requirements and current consumption in kilowatt-hours of electrical equipment used on the farm.

Appliance or machine	Motor horsepower			Approximate Consumption Kilowatt Hours
	Smallest	Largest	Size most used	
Apple grader	¼	½	¼	½ to 1½ per 100 bu.
Bottle washer	⅛	¾	¼	.5 per 1000 bottles
Bottling and capping machine	1/6	¾	¼	1 per 1000 bottles
Butter churn	⅛	¾	¼	1 to 2 per 100 lbs. butter
Brooder	—	—	—	½ per 6 weeks per chick
Cider mill	—	—	—	1 per 10 bushels
Corn husker and shredder	2	5	5	5 per ton
Corn sheller	¼	5	¼	1 per 300 lbs. shelled
Concrete mixer	¼	10	¼ and 5	5 per 5 cubic yards
Cream separator	1/10	¼	⅛	.5 per 1000 lbs., milk
Dairy water heater	—	—	—	15 to 35 per 100 gallons
Drill press	⅛	½	¼	5—Average per month for the farm shop
Emery wheel	⅛	1	¼	
Forge blower	1/10	¼	⅛	
Ensilage cutter	5	15	5	.8 to 1.5 per ton
Fanning mill	¼	½	¼	1.5 per 100 bushels
Feed grinder	1	7½	5	.1 to 3 per 100 pounds
Feed mixer	3	7½	5	1 per 500 pounds
Grain elevator	½	5	3 & 5	2 to 8 per 1000 bushels
Hay baler	3	15	7½	2 to 4 per ton
Hay hoist	3	10	5	.4 per ton
Incubator (Small)	—	—	—	150 to 300 per 1000 eggs
Irrigation pump (Surface)	—	—	—	2 to 4 per acre-ft. per ft. of lift
Lighting entire farm	—	—	—	25 to 30 per month
Milk cooler	—	—	—	25 to 30 per mo. per 10 gals. per day
Milking machine (Portable)	⅙	¼	⅙	1½ per cow per month
Milking machine (Pipe Line)	¾	3	1	2 to 3 per cow per month
Paint sprayer	—	—	—	1 per 250 square feet
Potato grader	½	1	½	1 per 600 to 700 lbs.
Refrigeration (Dairy)	¼	15	1	25 per mo. to 10 gal. of milk per day
Root cutter	¼	5	1	.2 per 100 pounds
Seed corn tester	—	—	—	2 per bushel tested
Sheep shears	½ hp. per clipper			1½ to 2 per 100 sheep
Sausage grinder	¼	½	¼	4 per 100 pounds
Soil heating (Hotbed)	—	—	—	½ to 1½ per day per sash (3′ x 6′)
Soil sterilizing	—	—	—	1 to 1½ per cubic ft.
Stationary sprayer	1½	25	7½	70 per acre per season
Thresher	—	—	10	⅓ per 100 lbs., grain
Ultra-violet rays for dairy cattle (S-1)	—	—	—	25 to 35 per year per cow
Ultra-violet rays for laying hens (S-1)	—	—	—	½ to 1 per year per bird
Ultra-violet rays for baby chicks (CX)	—	—	—	⅕ to ½ per brood per chick
Washing machine	⅙	¼	¼	2 per family per mo. (⅓ per person)
Water supply (all farm uses)	⅙	5	½	1 to 3 per 1000 gals. of water
Wood saw	5 to 7½			1 to 2½ per cord

THE COST OF FARMSTEAD WIRING AND ELECTRIC APPLIANCES

The cost of outlets may vary in different localities from $1.50 to $8.00, depending upon the kind of outlet and the cost of labor and materials. As a basis for estimating the cost of each installation, the Rural Electrification Administration suggests that the following prices be used for wiring:

Outlets, for ceiling, brackets, service receptacles, switches, barn outlets for lights, poultry house lights, incubator and brooder outlets, $2.50 per outlet.

Special outlets, for heavy-duty appliances such as electric range, and heating devices, $8.00 per outlet.

Motor outlets, $5.00.

Yard pole (25 feet in length), $10.00.

Interbuilding wiring, 7c per line foot.

Service line extensions beyond limit allowed in line construction contract, 10c per line foot.

There is a wide variation, also, in the types, sizes and cost of lighting fixtures and electric appliances (See Table 1).

Some idea of the cost of wiring and equipping a small house with lighting fixtures and a few appliances may be obtained by studying the data given in Table 3. The 29 outlets consist of 11 ceiling and wall lighting outlets, 8 convenience outlets, 9 wall switches, and 1 heavy-duty outlet for an electric range. The costs are based on medium-priced lighting fixtures and appliances.

CONTRACT FOR WIRING

If the work is to be done by an electrical contractor, a written contract should be signed by the contractor and owner. If the work of the contractor must pass inspection based on a code this should be so stated in the contract and provision should be made for withholding a stipulated percentage of the price of the work until the contractor presents the owner with a certificate of approval signed by an approved electrical inspector. Usually 60 percent of the price is withheld until the work is passed by an approved inspector. The contract should contain a definite agreement concerning the installation of the service entrance and fixtures in addition to outlets and switches. A suggested blank contract is shown on the second page of this circular.

Table 3. Method of calculating the cost of the wiring system, lights, fixtures and appliances for a small house.

Wiring system		
Entrance and service switches, wire and fuses		$ 25.00
28 Outlets at $2.50 (including outlets, switches and receptacles for lights and small appliances)		70.00
1 Heavy-duty appliance outlet, and wiring for water heater or electric range		9.00
Light fixtures		
Light bulbs	16 @ 15c	$ 2.40
Porches	2 fixtures, installed	1.50
Kitchen	1 ceiling fixture, installed	1.50
Living room	1 ceiling fixture, installed	5.00
Living room	1 floor lamp, installed	5.00
Bedrooms	2 ceiling fixtures, installed	3.00
Bathroom	1 wall fixture, installed	1.50
Hall and stairway	2 ceiling fixtures, installed	2.30
Cellar	2 ceiling fixtures, installed	1.50
Electric appliances		
1 Electric iron		$ 5.00
1 Washing machine		50.00
1 Vacuum cleaner		25.00
1 Refrigerator (7 cubic feet)		150.00
1 Shallow-well pump (not installed)		45.00
1 Radio		20.00
1 Electric range		150.00

Formerly No. 14 wire was used almost exclusively for residence branch circuits but owing to the increasing variety of electrical appliances used in the home, No. 12 wire is recommended. Electric ranges, water heaters, and some motors require larger wires, the sizes of which must be determined.

For further information consult your county or home agent, or write to the Kentucky Agricultural Experiment Station, Lexington, Kentucky.