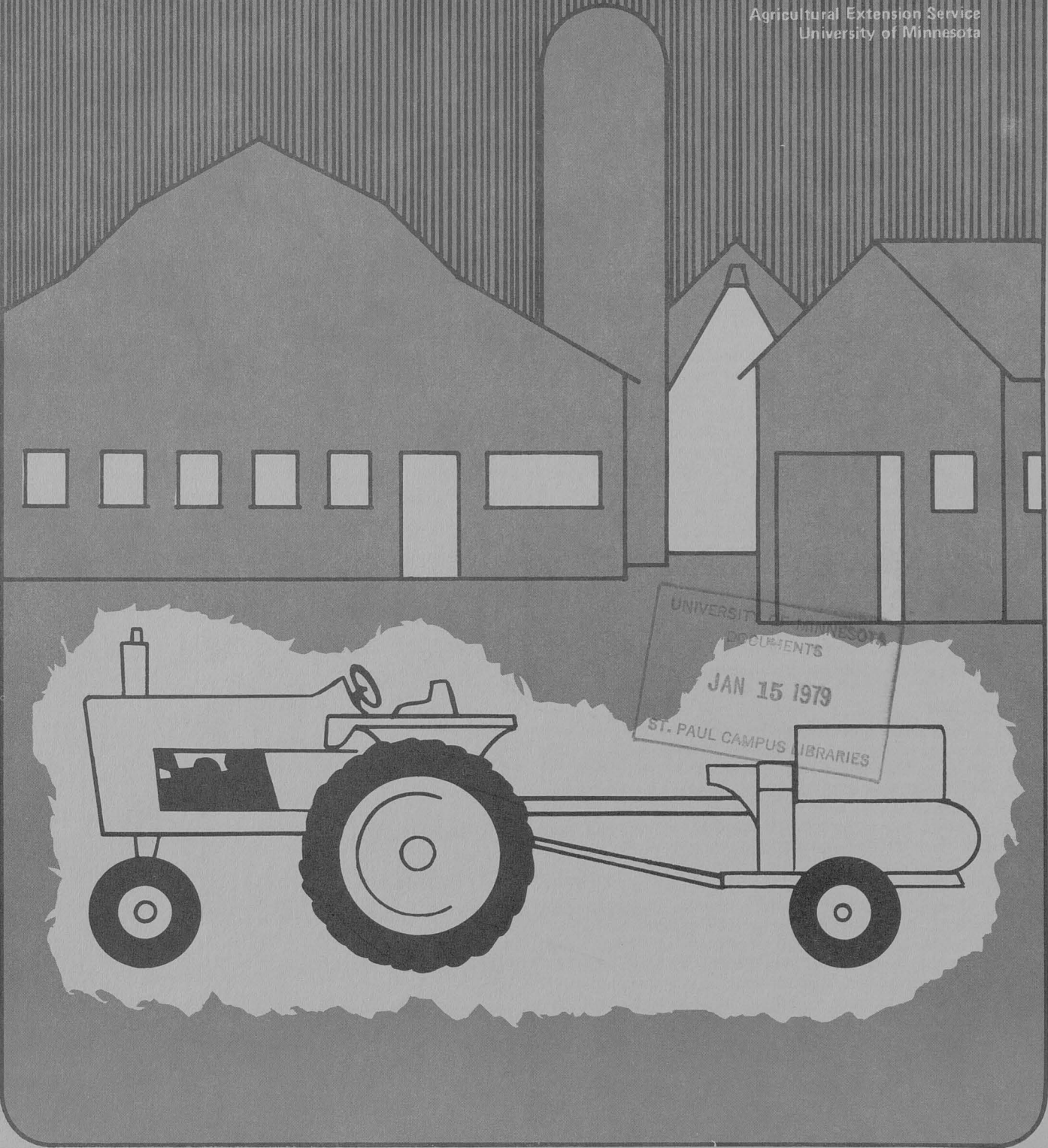


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Standby Electrical Power on Farms

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Standby Electrical Power on Farms

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Modern farming relies heavily on electricity to operate equipment such as heating systems, ventilating fans, mechanical feeders, milking machines, and water pumps. A power failure for any length of time could cause animal suffocation, loss of water and food supply, freezing of small animals, and loss of production. Such a power outage may be caused by snow storms, ice storms, floods, or an unavoidable breakdown of electrical transmitting equipment.

Standby electrical generators (including alternators) offer farmers assurance that they will have electricity in case of power failure. Many farmers today cannot afford to be without this added safety feature.

It is important that your standby electrical generating system is properly planned. You or any member of your family should be able to get the standby power system into operation even under severe weather conditions. The following guidelines will help you plan this system.

LOCATION

The standby unit should be operated near the main service entrance—a maximum distance of 50 feet is recommended to keep installation and wiring costs at a reasonable level. Mount the generator at this location, or store a portable unit under separate shelter and move it to the service pole for operation. Select an area for operation that will not be blocked by snow drifts or standing water during severe weather.

EQUIPMENT

A standby generator may be tractor-powered or have its own engine. Both types may be portable or permanently mounted. A portable unit also can be used in situations where electric power is not usually available; for example, in fields for welding equipment or power tools. A portable unit should be stored at the point of emergency use or be readily available, however.

Permanently mounted units must be at or near the service entrance and wired into the transfer switch. They should be securely bolted to a concrete base. Power take-off (PTO) driven units are subject to considerable torque during opera-

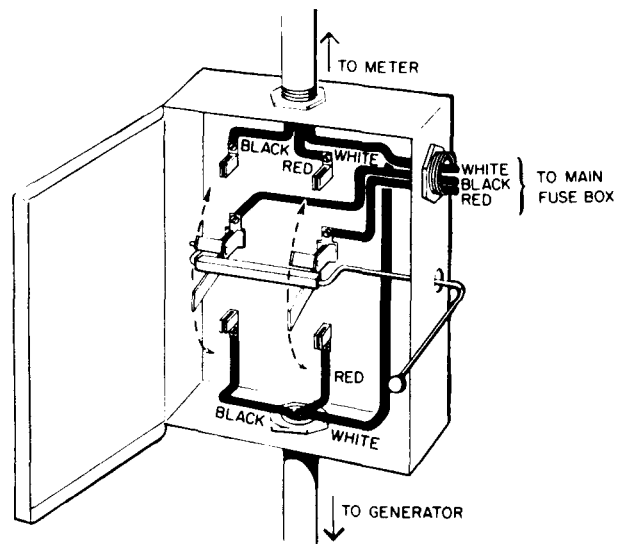
tion and must be well-anchored. Provide space for easy positioning of the tractor, and attach the PTO shaft to the generator so the shaft cannot be misplaced.

TRANSFER SWITCHES

The National Electrical Code requires that the standby unit be connected so electricity cannot be fed from the standby unit into the power company's supply lines. A *double-throw transfer switch* must be installed to prevent feedback into the main lines.

All electrical work, including the generator connections and double-throw disconnect switch, must be installed by a licensed electrician or approved by the local electrical inspector.

Wiring of a typical transfer switch.



ADEQUATE POWER

In general, the horsepower requirement for a standby unit is 2½ to 3 horsepower per 1,000 watt (1 kilowatt) output. A standby unit will have extra surge capacity for small periods of time; for example, a 13 kw standby unit would be capable of providing the 15 kw starting requirements for a 5 horsepower capacitor start motor starting under full load. Extra horsepower on the standby unit helps prevent voltage fluctuations when heavy loads are added or removed from the circuit. Thus, it is desirable to use a tractor considerably larger than that required as determined by the rated output of the standby unit.

The capacity required in a standby unit will be determined by the electrical equipment that is needed during the power outage. Most units are sized to carry only that part of the total farm load including essential functions. Ventilation fans, water pumps, freezer and furnace controls, and lights can be added according to their relative importance. Add up the wattage requirements of all necessary equipment to get the load capacity needed in a generator. Contact your power supplier for help in sizing the unit and planning the system.

SHELTER

Shelter for portable units is recommended where operation may be required during severe snow storms. Blowing snow can plug the air filters, causing engine failure. Permanently

mounted units should, of course, be under a shelter, with room for the tractor on PTO units.

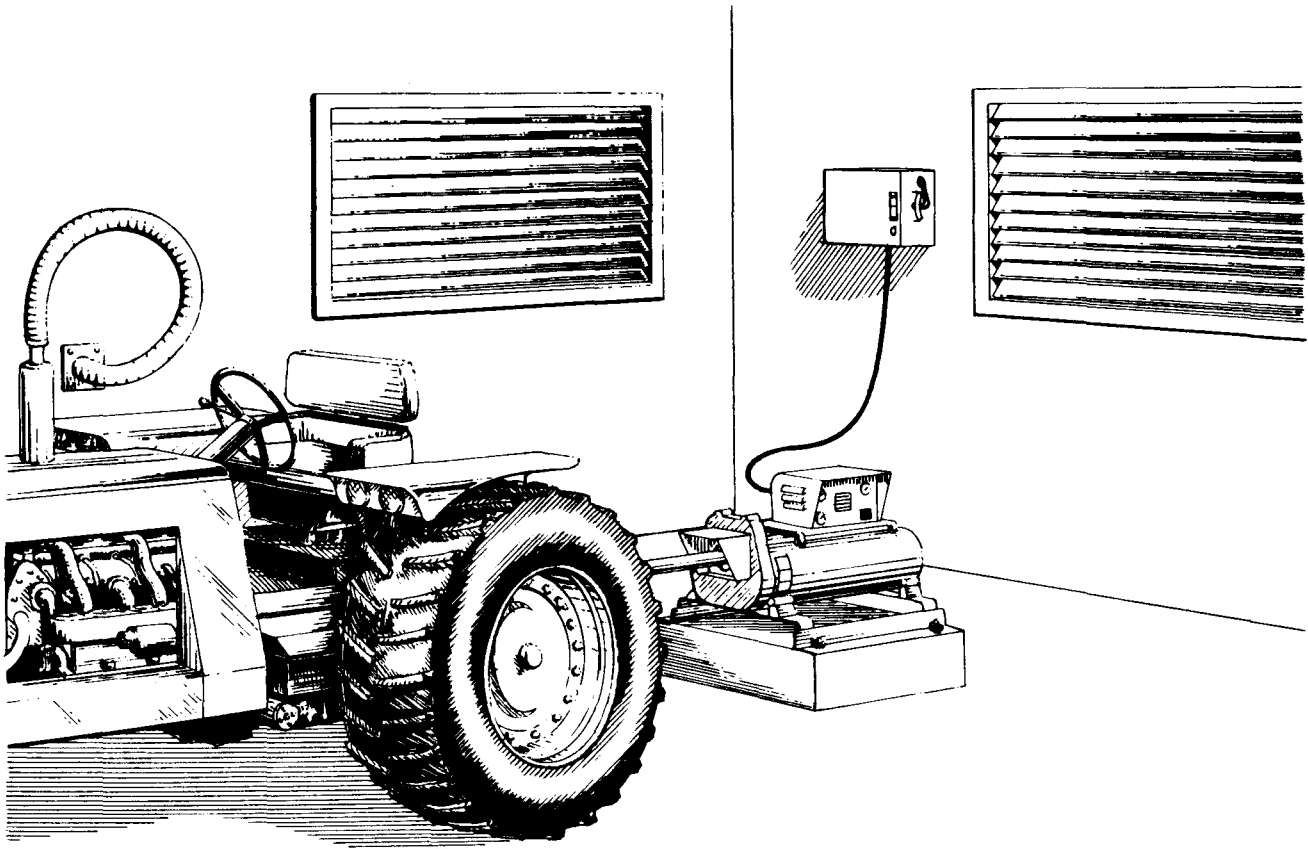
Where the engine is operated inside a building, the exhaust should be discharged outside with metal pipe. Also, ventilation is required to provide air for the engine and remove heat. Air inlets and outlets should have at least a ½-square-foot opening for each 1,000 watts of power produced.

ACCESSIBILITY

The standby system should be ready to go at all times. *The shelter should be oriented so that access doors are not likely to be blocked by snow drifts.* If a tractor is your power source, you may want to store the tractor in the shelter building in position to be connected to the standby unit. If it is not stored at the generator site, be sure it can be moved into place. This may require snow-moving equipment. A gasoline tractor may be preferred for easier starting in cold weather, or a diesel tractor may be equipped with engine heaters connected through an air temperature-sensing thermostat.

Since the standby system will not be in operation until after the power fails, be sure electrical power is not required to start or continue operating the standby system. Serious problems have occurred because electrically operated equipment such as door openers and fuel pumps were inoperative when the power failed.

A PTO generator in a sheltered installation.



OPERATING CHECKLIST

Whenever the system is activated, follow this procedure:

1. Call and inform your power supplier of outage conditions (when outage does occur).
2. For tractor-driven, PTO generators: Connect the PTO drive shaft securely to the generator and the tractor. Line up the PTO shaft as straight as possible between the tractor and the unit.
3. Turn off or disconnect all electrical equipment. (List switches to turn off, since equipment won't be running when power is off.)
4. Bring generator up to speed.
5. Move the transfer switch to standby.
6. When generator shows the proper voltage (120/240) start the largest critical motor and follow with remaining critical loads. Connect heating loads last. (Have a list of loads needed during an emergency, or a list of permitted loads if generator is designed for partial operation of total load.) If generator cuts out, repeat steps 2, 3, and 5.
7. If voltage drops below 100/200, turn off some equipment. Do not overspeed generator in an attempt to carry an overload.
8. Check the unit frequently. Engine and generator must have good ventilation for combustion and cooling. Outdoor installations need protection from blowing snow.
9. When service is restored (or at end of test), turn off electrical equipment and stop the generator.
10. Return transfer switch to normal power position.
11. Turn on equipment, starting with the largest motor.

(Post this operating procedure at transfer switch.)



PROTECTING AND MAINTAINING THE STANDBY UNIT

The unit should be kept clean, dry, and in running order at all times. Dust and dirt, which can accumulate when the unit is not in use, can cause overheating during operation. Moisture accumulation is a particularly serious problem. The unit should be located in a dry, well-ventilated area. Do not cover the unit with a polyethylene sheet or other moisture-proof material, because condensation may occur underneath the covering.

Small enclosures on the standby unit can be inviting to mice, birds, and other pests. Proper protection is essential. Galvanized wire mesh over small openings in the unit will minimize this type of damage.

Brushless generators require little maintenance. Dust and dirt should be blown from the interior of the generator by means of low pressure compressed air (30 psi or under). Most generator bearings are the sealed type and require no lubrication.

Generators equipped with brushes should be checked in accordance with the manufacturer's recommendations, but should not exceed 500 hours of initial running or 100 hours thereafter. If brush length is less than 0.5 inch (13 mm), the brush should be replaced.

On units with a commutator, an even brown film on the commutator is desirable and should not be removed. If the commutator becomes rough or dirty, it can be cleaned by using a fine grade of sandpaper. Emery cloth should not be used, since it contains metallic parts which could short-out the commutator segments.

Maintain your engine in accordance with the engine manufacturer's recommendations for type of lubricant and frequency of application.

To insure standby capability, the unit should be test-run every month. A start-up and operation under full-load for an

hour will check for problems such as overheating and loose connections. *An owner's service record showing hours of operation and test runs should be maintained.*

Employees and responsible family members should be trained to operate the unit. Use periodic test-runs for training.

SAFETY POINTERS

Accidents usually happen when you least expect them. The following precautions should be followed:

1. Shield all rotating parts, to prevent possible personal contact. Completely guard the power take-off shaft on PTO units.
2. *Place a list of operating instructions near the generator.* Even persons familiar with operation of the generator may forget during an emergency.
3. Never wear loose-fitting or ragged clothes, which could become tangled in moving parts, while working near a generator.
4. Firmly bolt generator to a solid base—either a trailer, floor, or pad.
5. When operating a generator indoors, always provide ventilation for fumes from the engine or tractor exhaust.
6. Never locate flammable materials near the generator.
7. *Have an ABC all-purpose, dry chemical extinguisher readily available* in case of fire in the generator or engine.
8. When working near a generator for a long period of time, wear hearing protection to guard against the extremely high noise level.
9. Shut off all equipment before connecting or disconnecting leads.
10. Be sure electric generators on engine- or tractor-driven units are grounded.