

Farm Structures FACTSHEET



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Stray Voltage



STRAY VOLTAGE

COMPLETE INSTRUCTIONS

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Stray voltage (also known as "tingle" voltage) is any voltage that appears in metal work, stanchions, pipes, conduits, etc. It is usually caused by current trying to get back to the transformer by the easiest route. Stray voltage can cause discomfort to farm animals; for example, if a cow touches a metal feeder that is charged with stray voltage, it gives her a shock as the current passes through her body.

Most farm animals react to voltages too low for humans to notice. They may lap at water rather than drink normally or leave a layer of feed in a steel trough. They sometimes hesitate or refuse to enter areas where they previously felt shocks (stall hardware, for example) while standing on wet concrete. When confined, they may jump, defecate and kick, creating problems for handlers.

A change in an animal's behavior is usually the first sign of stray voltage. However, as other things can cause similar reactions, have an electrician or other specialist run thorough tests with equipment that is sensitive enough to detect low voltages. Choose someone experienced in stray voltage measurement.

Although research has not proven that stray voltages directly effect production, animals may well suffer indirect effects that lower their productivity. For example, erratic behavior may mask heat detection and prevent timely breeding.

VOLTAGE LEVELS THAT CAUSE TROUBLE

The bodies of most farm animals have a much lower electrical resistance than those of humans. For example, a cow's resistance is about 360 ohms for a current path from the mouth to all four hooves. This lets her feel much lower voltages than you can — most cows respond to only 4 mA (milliamperes); some can feel 2 mA.

Consider a cow that can feel as little as 2 mA (0.002 A). We can use Ohm's law (amperes × ohms = volts) to calculate the voltage that will give her a shock: $0.002 \times 360 = 0.72 \text{ V}$. If she attempts to eat or drink from a metal bowl, she will be able to feel only 0.72 V between the bowl and the concrete floor!

A 45 kg growing pig has mouth-to-hoof resistance of about 930 ohms, or about 2.5 times that for a cow. In this case, it takes 1.86 V to cause a 2 mA current. Given a choice, growing pigs avoid drinkers that give them more than 0.5 mA. If not given a choice, they will tolerate 5 mA, but may not drink enough water.

Try to eliminate stray voltages above 0.5 V; you may not feel them (especially if wearing rubber boots) but the animals might.

CAUSES

Contrary to popular belief, stray voltage seldom comes from the "hot" wire in an electrical circuit unless there is a ground fault. Ground faults occur when insulation fails in wiring or equipment (for example, between the copper windings and magnetic core of an electric motor) and can create potentially lethal stray voltages. For this reason, the Canadian Electrical Code demands that all metal in animal buildings be connected (bonded) to the electrical ground at the service entrance.

High-voltage devices (such as cow trainers, electric fences and poultry antiroosting wires) can induce a nuisance form of stray voltage on nearby unbonded metal hardware. An animal or human touching the metal feels a mild shock similar to that from static electricity on a dry winter day. The solution is simple — bond the metal to ground at the barn's electrical service as required by the code.

The most common and troublesome stray voltage is caused by the currents that normally flow through the neutral wire in an electrical circuit. Theoretically, the

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Website: <http://www.cps.gov.on.ca>