



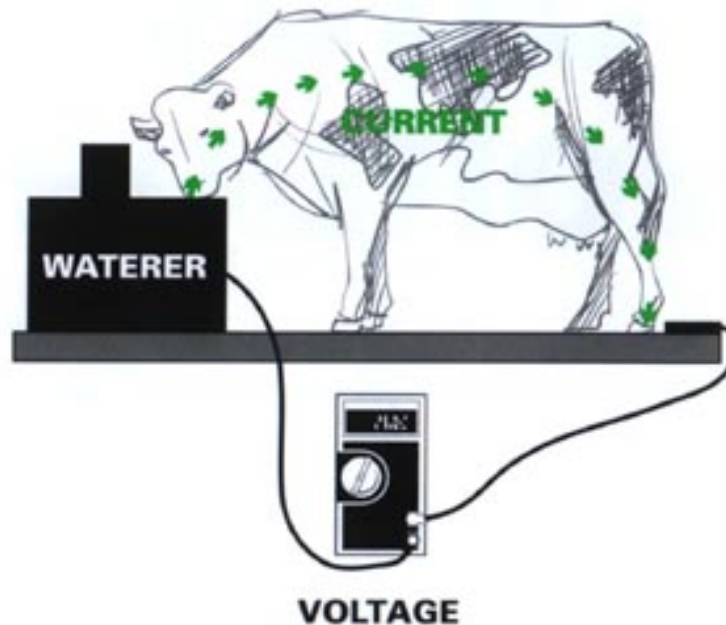
- MAEC Home
- About MAEC
- Recent News
- Publications
 - Training
- Electrical Technology Program
- Directions & Lodging
- Links

STRAY VOLTAGE

Stray Voltage Questions and Answers

What is stray voltage? Stray voltage is an electrical voltage measured between two points a farm animal may touch at the same time, generally less than 10 volts. If this occurs, a current may flow through the animal between those points. These voltage levels are seldom perceived by people.

The amount of current depends on the voltage and the total resistance of the circuit. Livestock respond to the resulting current flow, not to voltage.



How can stray voltage affect livestock?

- Livestock respond to or can feel current. Voltage is measured to estimate the amount of current that could flow through an animal.
- When an animal touches two points at different voltages, current

flows because the circuit is completed.

How do livestock respond to stray voltage and current?

Current flow	Perception (1)	Behavior Response (2)	Production Loss (3)	Voltage Level (4)
0.001 ampere	less than 1 in 50 animals	none	none	0.5 volt
0.002 ampere	less than 1 in 10 animals	none	none	1 volt
0.004 ampere	majority of animals	short-term changes with some animals	none	2 volts

(1) Perception is an animal's first awareness of current.

(2) Behavior Response is a change in behavior, usually observed as an animal avoiding an object or area.

(3) Production Loss is a drop in expected performance, often associated with a decrease in water or feed consumption for a substained period of time.

(4) Voltage Levels represent a worst-case condition for a voltage between two points an animal touches. An example would bean animal standing on a sloppy wet floor or earth and touching a ground metal watering device with its nose. A more typical farm condition,with an animal standing on concrete, would require voltages that are about twice as high to get the same current level.

The table above is for 60 cycle electricity as used on farms.

What level of voltage is acceptable? By keeping the voltage level between animal contact points below two volts you will:

- Prevent behavior changes.
- Provide an environment where livestock production will not be affected by stray voltage.

What are common sources of stray voltage?

- Equipment ground faults.
- Improper separation of equipment grounds and neutral wires in buildings.
- Improperly installed electric fences.

How do I prevent stray voltage?

- Proper electric equipment maintenance.
- Properly installed and maintained wiring splices and connections.
- Provide adequate sizing of electric wires for load and distance.
- Provide adequate electric service and equipment grounding.
- Proper installation of an equipotential plane, a grounding grid in the floor that's connected to piping and equipment.
- Provide adequate separation of electric fence grounding from farm electric system grounding.

What are some of the indicators of stray voltage?

- Abnormal livestock behavior around any metal objects.
- A person feels a shock or tingling sensation when touching pipes or equipment.
- Lights that bright or dim when electric loads are changed.

Symptoms commonly associated with stray voltage can be caused by many other factors.

If you think you may have a stray voltage problem: Contact your local electric power supplier for a stray voltage evaluation or for help with establishing your own stray voltage monitoring program.

The Michigan Agricultural Electric Council (MAEC) develops and presents educational programs on electrical issues to agricultural professionals. MAEC members include academic, regulatory and industry representatives from Michigan State University, the Michigan Public Service Commission, Consumers Power Company, the Michigan Rural Electric Cooperatives and the Telephone Association of Michigan. For more information about the effects of stray voltage, please

reference A Review of Stray Voltage Research: Effects on Livestock by R.J. Fick and T.C. Surbrook, Agricultural Engineering Department, Michigan State University. Michigan State University is an Affirmative Action/Equal Opportunity Institution. Programs and materials are open to all without regard to race, color, national origin, sex, disability, age or religion. 6:96 - 15M - KMF, File 18:34 (Electrical Wiring), Extension Bulletin E-2605 Keith Tinsey / MAEC / Stray Voltage: Questions and Answers

Keith Tinsey - Managing Director
103C Farrall Hall
Agricultural Engineering Department
Michigan State University
East Lansing, MI 48824-1323
USA
Telephone: (517) 353-0643
FAX: (517) 432-1563
Email: tinsey@msu.edu

Direct web site comments or questions to: [webmaster](#)
[Agricultural Engineering | Michigan State University](#)

October 11, 2002