

## What are common sources of stray voltage?

- Equipment ground faults.
- Improper separation of equipment grounds and neutral wires in buildings.
- Excessive voltage drop on the electric system neutral wires.
- 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 get 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. This service is provided under the Michigan Public Service Commission Rule governing animal contact current mitigation.

A copy of the MPSC Stray Voltage rule is available at:

<http://maec.msu.edu/pub.htm>

The Michigan Agricultural Electric Council ( MAEC ) develops and promotes educational programs related to electrical energy and issues in the agricultural community. Members include representatives from electric power suppliers, Michigan Public Service Commission, Michigan State University Extension, and Michigan State University.

Agricultural organizations and State Department representatives provide input to activities on a regular basis.

For more information about the effects of stray voltage, please reference the publication: *A Review of Stray Voltage Research: Effects on Livestock* available at the above web site.



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# Stray Voltage

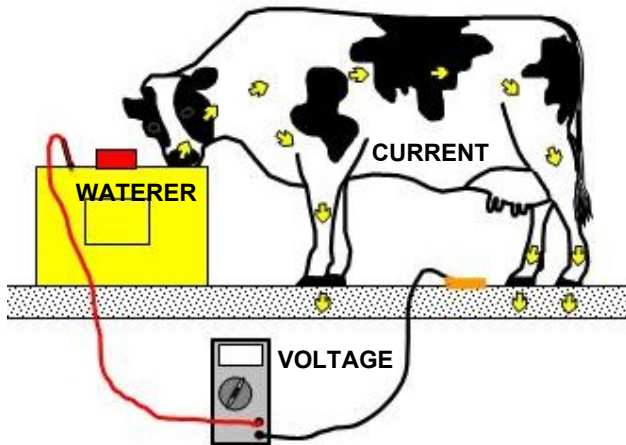
## Questions and Answers



## 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 contact 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, and 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?

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

( 1 ) These voltage levels represent a *worst-case condition* for a voltage between two points that an animal touches. An example would be an animal standing on a sloppy wet floor or earth and touching a grounded metal watering device with it' s 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.

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

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

( 4 ) Production loss is a drop in expected performance, often associated with a decrease in water or feed consumption for a sustained period of time.

*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.