



# Stray Voltage

Stray voltage is a well understood electrical phenomenon that can be easily detected and corrected. MREC member utilities have Programs to assist farmers who have stray voltage concerns.

## Key Points

- The safe use of electricity is dependent on our electrical systems being properly grounded. These code required grounding points occur both in our distribution system and in the wiring within our homes and farms.
- Stray voltage is a natural consequence of operating safely grounded electrical systems. On a properly wired farm there will always be some stray voltage present. Stray voltage is not a mystery. It is not difficult to identify sources and maintain levels below those known to be harmful.
- There are several potential contributors to stray voltage, including improper or damaged grounding systems, improperly installed electrical equipment, and in some instances, failures in the local distribution system serving the farm.
- If you suspect that you may be experiencing stray voltage on your farm, your MREC member electric utility can provide assistance to help you determine if the levels of cow contact voltage on your farm are excessive.

## Questions and Answers

### *What is stray voltage?*

Following a review of research and numerous technical conferences and public hearings, the United States Department of Agriculture (USDA) has defined stray voltage as "low level voltages present across points (for example, drinking cup to rear hooves) in which a current flow is produced when an animal simultaneously comes into contact with them." For safety reasons, the electrical code requires that the grounded conductor of all farm electrical systems be connected to barn metal, including water lines.

This means there is always some small amount of voltage present in the animal environment. If an animal contacts two surfaces with a voltage difference between them, a weak electrical current can flow through the animal. Stray voltage can cause a problem when it is felt by the cow and is high enough to cause behavioral changes. These changes may include reduced feed or water consumption, nervousness or excessive movement during milking, or avoidance of particular areas.

*What are the typical contributors to stray voltage?* Stray voltage may be the result of either on- or off-farm electrical sources, or some combination of each. Potential causes of stray voltage on a farm include improperly made electrical connections, improper or damaged grounding systems, improper separation of electrical equipment grounds and neutral wires in buildings, and improper installation of electric fences, trainers or milking systems. While experience has shown that a majority of stray voltage sources are directly related to farm operation, utility distribution system sources may also be a contributing factor. Utility sources may include improper grounding, undersized conductors, loose electrical connections, and inadequate system balance.

### *Can we get rid of stray voltage?*

The laws of physics and the electrical code safety requirements make complete elimination of stray voltage impossible. Stray voltage will always be present at some level. However, properly installed and maintained electrical systems can keep this voltage at a low level that science has shown does not have a negative impact on cattle.

### *How do we measure stray voltage?*

Stray voltage can be easily and accurately measured using highly sensitive voltmeters and ammeters. Testing techniques have been developed by scientists from the United States Department of Agriculture and several universities.



These techniques are used by MREC member utilities. This testing may extend for a day or more in order to determine both the pattern and causes of stray voltage. Several different measurements are made and conditions are examined to identify maximum exposure levels and pinpoint stray voltage sources.

#### ***What should I do if I suspect a stray voltage problem?***

If you suspect stray voltage on your farm, contact your electric power supplier. MREC member utilities have a good understanding of the potential sources of stray voltage and trained and experienced specialists who can test for stray voltage, diagnose a potential problem, and recommend safe, cost-effective solutions.

#### ***What are MREC member utilities doing?***

MREC member utilities continue to work with State agencies, Universities, and agricultural organizations to stay apprised of ongoing research and address the concerns of dairy farmers. MREC member utilities provide on-farm consultation and stray voltage testing to their customers. MREC member utilities can help you to identify and correct stray voltage problems caused by improper or outdated wiring on your farm and to improve the safety and efficiency of your farm's electrical system. If unacceptable levels of stray voltage are determined to be from off-farm sources, MREC member utilities will take the necessary actions at no cost to the customer to reduce utility sources of stray voltage to acceptable levels.

MREC member utilities continue to support research for maintaining the safety and improving the efficiency of our distribution system so that we do not contribute to a stray voltage problem. All distribution system upgrades follow both State and National Electric Safety Code requirements to minimize the potential creation of stray voltage.

#### ***How can I obtain more information?***

If you have specific questions about stray voltage or are concerned that you may have a stray voltage problem on your farm, you can call your electric utilities directly or visit the MREC web site at [www.mrec.org](http://www.mrec.org) for more information on stray voltage testing, a review of research on the effects of electricity on farm animals and other aspects of farm energy management, farm wiring, and electrical safety.

#### ***What is the MREC?***

The MREC is a membership organization of energy suppliers, energy service professionals and Land Grant Universities whose mission is to support outreach, education and research on rural energy issues for the benefit of:

- Farms and other rural energy consumers
- Rural energy suppliers
- Farm organizations and agricultural trade associations
- Electrical equipment and allied industries
- Government and regulatory agencies

