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MREC

March, 2005

Powering the Dairy Industry

A Symposium for dairy producers
and their energy service providers

Your Electrical System

How to do it right the first time
and when is it time to rewire

Fact: In many rural areas, a pick-up truck and a tool bucket is all that is needed to be an electrician

Fact: Millions of dollars
have been spent on farm
wiring that does not
meet the minimum
safety codes

When is it time to rewire?

Anytime you add more than 5 hp

Never connect new loads greater than 5hp without contacting the power provider and a qualified electrician.

•1989 to 2002

•SCC

Decrease of 13%
When load

balancing issues
are uncontrollable

Cyclical loads are nearly impossible to control.

During expansion.

Connecting old to new is never a good idea.

**When experiencing
Dimming lights &
Burned out motors**

Size wires for load and length of run

*Voltage drop from transformer to load < 5%
Voltage drop

After lightning strikes

Never trust wiring that has been damaged during a storm.

After physical damage

High impedance connections can cause equipment failure and can be very hard on sensitive electronic equipment.

What kind of wiring will you find on farms?

What does the Electrical Code require?

New wiring should be:

Conservation driven

Safe

Stray Voltage

Re-wire

Four-wire systems

PVC conduit

No aluminum wire or cable

Electricians must be trained and pre-qualified

No payment until after approval from state inspector

National Electrical Code

Chapters 1-4 basic rules for all wiring

Chapters 5-7 additional rules for special cases

Article 547 (chapter 5) special requirements for agricultural buildings

Section 90.5

(A) Mandatory Rules.

Identify actions that are specifically required or prohibited and are characterized by the use of the terms shall or shall not.

Section 90.5

(B) Permissive Rules. Identify actions that are allowed but not required. Used to describe options or alternative methods, and are characterized by the use of the terms shall be permitted or shall not be required.

Section 90.5

(C) Explanatory Material. References to other standards, related sections of this Code, or information related to a code rule, is included in the form of fine print notes (FPNs). Fine Print Notes are informational only and not enforceable requirements.

NEC 547 Agricultural Building Classifications,

547 . 1 Scope.

Applies to agricultural buildings, part of a building or adjacent areas of similar or like nature as specified in 547.1 (A) and (B)

•Use wire and fixtures suitable for the environment

(A) Excessive Dust and Dust with Water.

Litter or Feed Dust
Mineral Food
Particles

(B) Corrosive Atmosphere.

- (1) Poultry and Animal Excrement
- (2) Corrosive Particles and Water
- (3) Damp and Wet;
Washing, Cleaning and sanitizing
- (4) Similar Conditions

Dry Buildings??

Dry 100% of the time (interpretation of environment is a problem)
Surface wiring recommended
Use conduit where physical damage may occur

Dry...never happens!

Excessive dust and dust with water

Dust and dust with water may accumulate

Buildings With Dust or Dust/water, or Corrosive

UF, or copper SE, cable with approved termination fittings

Boxes and fixtures

Dust-proof and Weatherproof enclosures

Motors shall be totally enclosed

Corrosive atmosphere

Animal excrement may cause corrosive vapors

Corrosive particles may combine with water

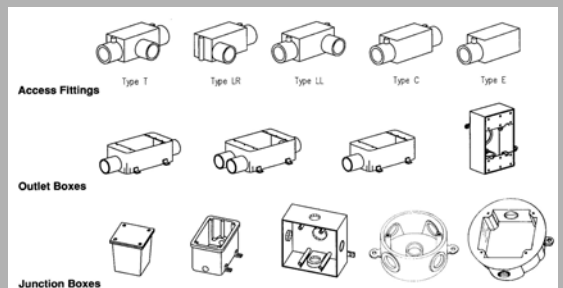
Damp and wet because of washing

Minimize entrance of dust.
Protect from physical damage.
Shall be watertight.
For dusty locations, feed rooms, haymows.
Dust-tight fixtures.

For wet and wet + dusty locations.
Nonmetallic fixtures, sealed and gasketed.
Molded plastic or fiberglass.
Heat lamps.
Porcelain base to withstand high temperature.

•Every connection, switch, plug, splice must be enclosed in a box

Types of boxes



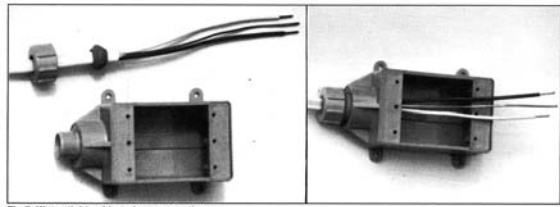


Fig 7. Water-tight cable-to-box connection.

Dust and water tight cable to box connector

Neoprene or plastic bushing

Cable Types

UF

NMC

SNM

copper SE

With approved termination fittings

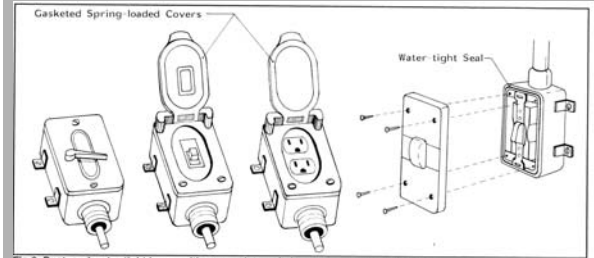


Fig 6. Dust- and water-tight boxes with appropriate switch covers or receptacle covers.

•Mount where protected
from animals and moisture

Always Use Plastic Pipe

Schedule 40 PVC ½ - ¾ inch most
common

Steel not suitable for wet /
corrosive areas

Surface mount on walls and
ceiling

¼ Inch from wall where
washed

Support 3 foot (1
meter) spacing
Seal around openings
from warm to cold
areas
Glued or threaded
connections
Allow for expansion

**Motors
shall be
totally
enclosed**

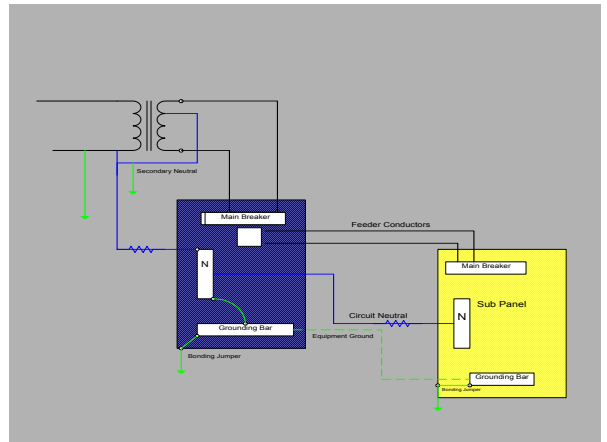
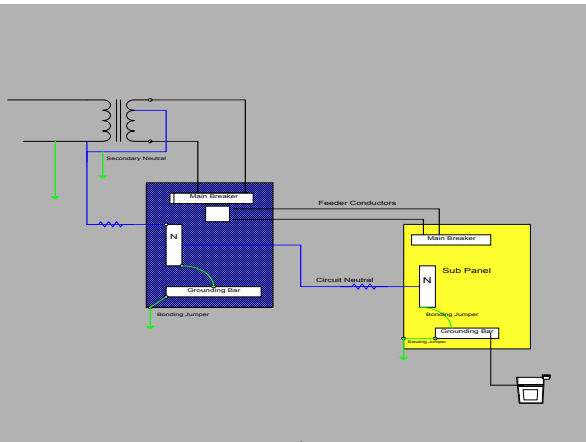
- NEMA Ratings
- 3R Rain Proof & Ice/Sleet Proof - Outdoors
 - 3S Dust Tight, Rain Tight, & Ice/Sleet proof - Outdoors
 - 4 Water Tight & Dust Tight - Indoors
 - 4x Water Tight, Dust Tight, and Corrosion Resistant - Indoors

Use 4X as per Cook

**You must
four-wire
Ag buildings.**

**Secondary neutral voltage
1988 to 2000: 4% increase**

**Installations of
4-wire systems
Up 100%**



Positives

- Reduces on farm source voltages at cow contact
- Eliminates cyclical 120 volt load problems (no load balance required).
- Reduces amount of secondary neutral current returning through the earth.

Negative

- A four-wire service meeting all the requirements of code is difficult to achieve.
- Confusion regarding code requirements.
- A four-wire service only corrects the on farm service being four-wired.
- Improper installation can cause V_c to increase.
- Cost



Coming soon!
Mandatory Inspection
Mandatory Certification of Electricians

Questions?