Stray Electricity

- Occurs as small voltage differences between
  - structure and the floor
  - structure and installed equipment
  - floor and equipment
  - or through liquids
- Voltage difference - current will flow
- Generally less than 10 volts
Cattle Responses

- Unexplained production drops
- Increased evidence of mastitis
- Elevated somatic cell counts
- Longer milking times
- Incomplete milk let down
- Nervousness while in the parlour
- Rapid exit from the parlour
- Reluctance to use water bowls or metallic feeders
- Altered drinking habits
Confusing Factors

- Mistreatment
- Uncomfortable stalls
- Milking machine problems
- Slippery floors
- Disease
- Sanitation
- Nutritional disorders
Body Resistance

- Cows more susceptible than humans
- Their bodies are better conductors of electricity
- 4 legs, spaced apart, wet conditions and no insulation
- The ease at which current can flow through a cow's body depends on which path it takes
Body Resistance

- Different individuals, either cows or humans, react differently to voltage differences due to their physiological makeup.
- Human resistance - 30 times that of cows.
Causes

• Poor electrical connections
• Corrosion of switches
• Defective wiring
• Frayed insulation
• Faulty equipment
• Heavily loaded power lines
• Imported
  – from other buildings
  – or from other users
Causes

• Induction voltage
  – Unwanted/extra electrical cable wrapped in a coil around metal piping
Understanding the Problem

• Finding the cause is generally not simple
• different sources may act together and at different times
• on-farm and off-farm sources may act together and at different times.
Understanding the Problem

• Main earth wire and neutral connected at ESB's main fuse
• Therefore neutral is connected to the main earth and any bonding earth beside the parlour
• Neutral is also connected to earth at the transformer and at certain ESB poles
Understanding the Problem

• A voltage difference can occur between the ends and various parts of the neutral along its path between the milking shed and the transformer.

• The voltage difference becomes distributed over the ground surfaces around the transformer and around the milking shed.

• Resulting in voltage differences between different parts of the shed.
Voltage Drop

• Voltage drops when the electrical load is heavy

• About 5% is acceptable - above 10% is not

• Causes
  – load on transformer too much
  – cables too small
  – or transformer too far away from the parlour
Voltage Drop

• Shortens the life of electric motors
• Can lead to stray electricity - because
  – various items of electrical equipment with different loads gives rise to different voltage drops in the cables supplying
  – This causes neutral to earth voltages leading to stray electricity.
Preventing or minimising Stray Electricity

- A high standard of electrical installation
- Comply with the ETCI rules
- Engage an electrical contractor - RECI approved
- ESB booklet “Farm Well…Farm Safely” and information pack
- Maintenance
- No temporary makeshift repairs
Equipotential Bonding

• Connect all metallic cow and milker contact objects in the parlour and the dairy together to form an equipotential cage
• Independently connect each major object to a bonding busbar
• Use “4 square” (4mm\(^2\) cross-sectional area) earth wire (green/yellow PVC coated)
Equipotential Bonding

- Use special non-corroding bonding straps
- Loop the wire from item to item
- Connect busbar back to the earth in the distribution board
- Bonding is only as good as the soundness of the electrical connections
- Dirty metal or corrosion will not allow small currents to pass through the connection
Equipotential Bonding

- 10mm\(^2\) earth wire from busbar to earth rod
- Earth rod with a non-corroding secure attachment
- Metal grid in standings and pit
  - Use A142 mesh - within 40-50mm of the surface
  - Extend the mesh as far as possible into the yard
  - Turn mesh down into the ground at 45\(^0\)
Equipotential Bonding

- ETCI - supplement to section 705
- New installations
- Existing installations
  - new floor screed
  - copper wires in slots in floor
Electric fence controllers

• No electric fence controller in or near a dairy, milking parlour or any livestock buildings
• Separate earth at least 10m away from ESB poles, the parlour earth and the main earth
• Never locate the fencer earth between protective earths
Electric fence controllers

- Using a number of earth rods and locate them in damp ground
- Fix up any shorts around the farm
- A short may bring a high voltage to the fencer earth
- If the fencer earth is inadequate or is too near other earths, this voltage may end up in the parlour
Detection Procedures

- Wet floor
- Switch on all electrical equipment
- Measure AC voltage between wet floor and rump rail, pipeline, feeders and other conductible metal objects
- Measure AC voltage between a neutral wire and an earth wire
- Voltage greater than 0.75 V AC indicates a possible problem
Detection Procedures

• Switch off each item of equipment to see if the voltage is reduced
• Disconnect the live by removing each fuse or switching off each MCB in turn to see if the voltage is reduced
• If voltage remains ask the E.S.B. or your electrical contractor to investigate the problem further
• Loop impedance test