

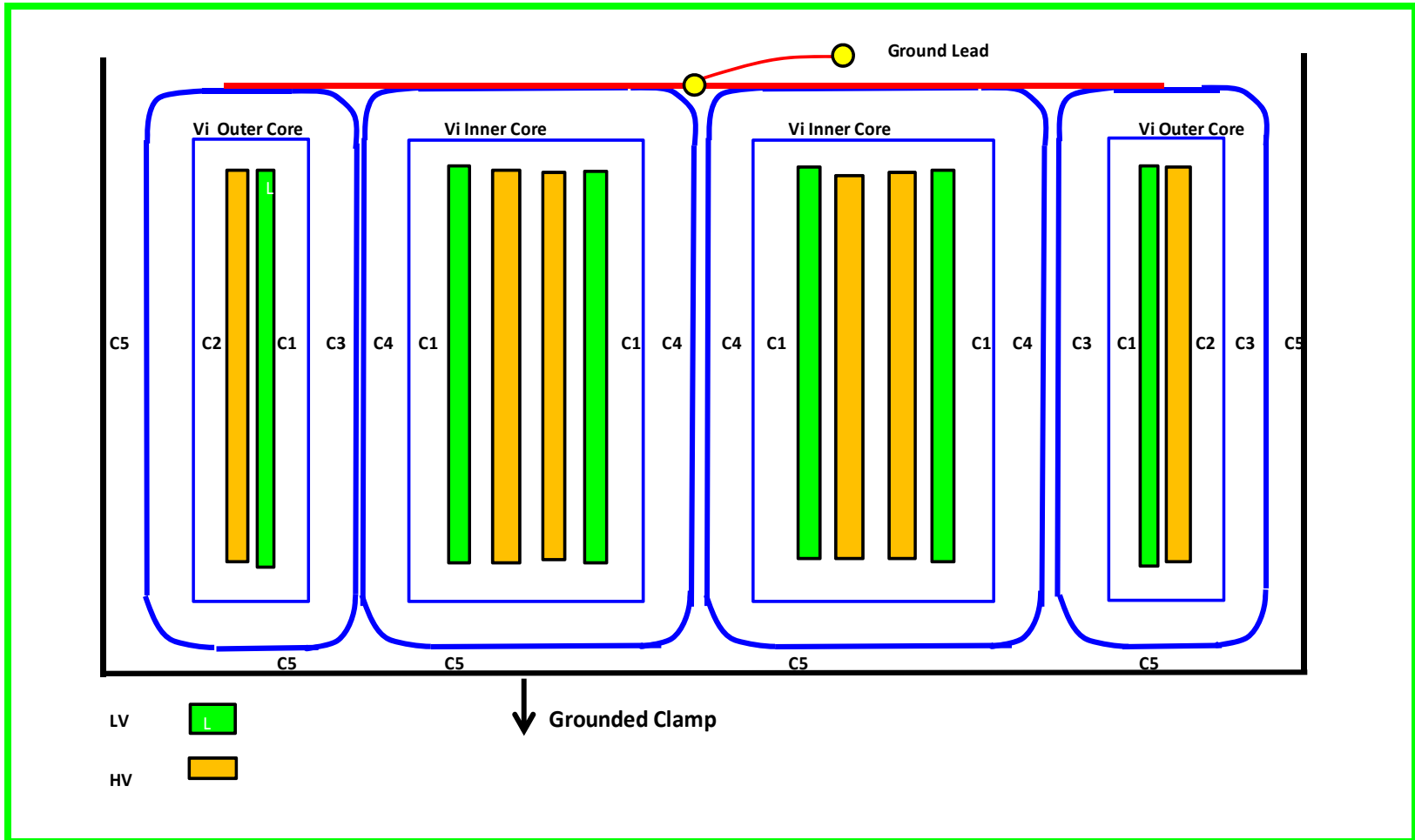
# **Transformer Core Grounds**

By Philip J Hopkinson, PE

- 1. The issue is gassing and Partial Discharge**
- 2. Dielectric Breakdown in windings not the problem**
- 3. Gassing and PD worst at 34.5 kV**
- 4. Gassing not an issue at 5 kV**
- 5. Gassing at 15 kV an annoyance only**
- 6. Gassing coming from Core**
- 7. Solution via grounding or shielding**

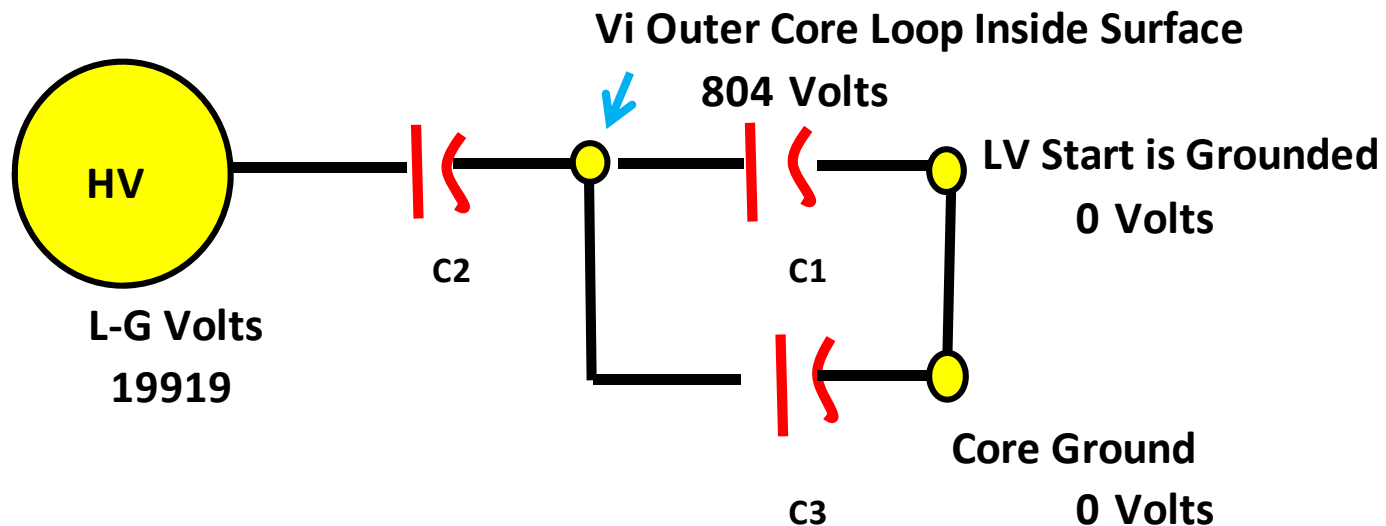
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Case I, Core Ground Connected to Frame

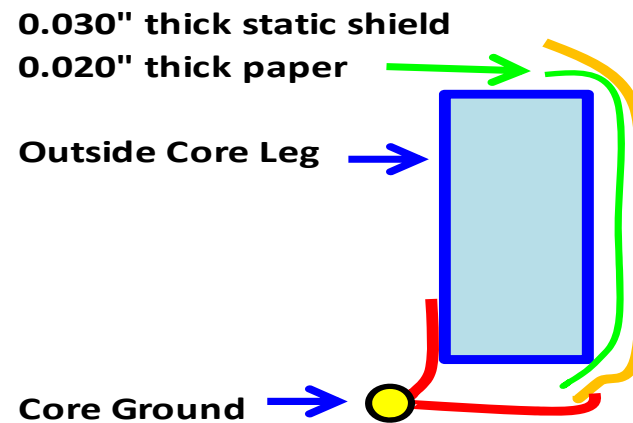
Voltage drop in Outer Core stacks = **804 Volts**

**1. Outside core grounds at 34.5 kV result in high core volts**

**2. Inside core grounds eliminate static charges and drop core volts to volt/turn levels**

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## Grounded Electrostatic Shield

1. Outside core grounds at 34.5 kV result in high core volts
2. Inside core grounds eliminate static charges and drop core volts to volt/turn levels
3. Core shields equally effective

# **Transformer Core Grounds**

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## **With Outside Core Ground and no core shield:**

- 1. Hydrogen at 15 kV typically 100-300 ppm**
- 2. Hydrogen at 34.5 kV typically 3,000-10,000 ppm**
- 3. Hydrogen accompanied by small amounts of**
  - a. Ethane**
  - b. Ethylene**
  - c. Methane**

# Transformer Core Grounds

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## With Outside Core Ground and no core shield:

1. Partial discharge best detector
2. PD should be conducted per Class II transformers
  - a. Start at 50% of rated volts
  - b. Go to 100% of rated volts and record
  - c. Go to 110% of rated volts and record
  - d. Go to 150% of rated volts and hold for 1 hour
  - e. Drop back to 110% of rated volts and hold for at least 10 minutes and record.
  - f. Drop back to 100% of rated volts and record.
  - g. Drop back until pd extinguishes below 100 pc
3. Transformer fails if extinguish less than 110% of rated volts