

CALCULATION OF CAPACITANCE IN CONCENTRIC CABLE

$$C_0 = \frac{0.048 \epsilon}{\log \left[1 + \frac{T+t}{d} \left\{ 3.84 - 1.7 \frac{t}{T} + 0.52 \frac{t^2}{T^2} \right\} \right]} \quad \mu F / \text{mile.} \quad 1 \text{ mile} = 2.54 \text{ km}$$

T = THICKNESS ON CONDUCTOR INSULATION (in)

t = THICKNESS OF BELT INSULATION (in)

ϵ = DIELECTRIC CONSTANT

d = DIAMETER OF CONDUCTOR (in)

ph
CONDUCTOR INSULATION = 0.508 cm
THICKNESS
DIELECTRIC CONSTANT = 3.6
CONDUCTOR DIAMETER = 1.65 cm

BELT THICKNESS = 0.43 cm.

CALCULATE THE CAPACITANCE TO NEUTRAL

for 1 km $\langle 1 \text{ mile} = 1.609 \text{ km} \rangle$

$$T = 0.508 \text{ cm} = \frac{0.508}{2.54} = 0.2 \text{ in}$$

$$t = 0.43 \text{ cm} = \frac{0.43}{2.54} = 0.17 \text{ in}$$

$$d = 1.65 \text{ cm} = \frac{1.65}{2.54} = 0.65 \text{ in}$$

$$\epsilon = 3.6$$

$$C_0 = \frac{0.048 \times 3.6}{\log \left[1 + \frac{0.2 + 0.17}{0.65} \left\{ 3.84 - 1.7 \frac{0.17}{0.2} + 0.52 \frac{0.17^2}{0.2^2} \right\} \right]}$$

$$C_0 = \frac{0.048 \times 3.6}{\log 2.57} = 0.42 \mu F / \text{mile} = \frac{0.42}{1.609} = 0.26 \mu F / \text{km}$$

$$C_0 = \frac{0.048 \epsilon}{\log \left[1 + \frac{T+t}{d} \left\{ 3.84 - 1.7 \frac{t}{T} + 0.52 \frac{t^2}{T^2} \right\} \right]}$$

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CONDUCTOR	INSULATION = 0.508 cm	CONDUCTOR DIAMETER 1.65 cm
THICKNESS		
DIELECTRIC CONSTANT = 3.6		
BELT THICKNESS = 0.43 cm.		

CALCULATE THE CAPACITANCE TO NEUTRAL

for 1 km 1 mile = 1.609 km

$$T = 0.508 \text{ cm} = \frac{0.508}{2.54} = 0.2 \text{ in}$$

$$t = 0.43 \text{ cm} = \frac{0.43}{2.54} = 0.17 \text{ in}$$

$$d = 1.65 \text{ cm} = \frac{1.65}{2.54} = 0.65 \text{ in}$$

$$\Sigma = 3.6$$

$$C_0 = \frac{0.048 \times 3.6}{\log \left[1 + \frac{0.2 + 0.17}{0.65} \left\{ 3.84 - 1.7 \times \frac{0.17}{0.2} + 0.52 \times \frac{0.17^2}{0.2^2} \right\} \right]}$$

$$C_0 = \frac{0.048 \times 3.6}{\log 2.57} = 0.42 \text{ } \mu\text{F/mile}$$

$$= \frac{0.42}{1.609} = 0.26 \text{ } \mu\text{F/km}$$

UNDERGROUND CABLE FAULT FINDING

Q. EXPLAIN THE METHODS APPLIED TO FIND THE FAULT IN UNDERGROUND CABLE.

UG FAULTS NEED TO BE DETECTED BY SECTIONALIZATION. LINE IS DIVIDED INTO PORTION AND FAULT IS TO BE FOUND IN EACH PART.

THUMPING

SUPPLY H.V. INTO THE CABLE. LISTEN THE NOISE.

APPLIED VOLTAGE = 25 KV.

DISADVANTAGE

- DEGRADE THE INSULATION

TIME DOMAIN REFLECTORY

SEND LOW ENERGY INTO THE LINE. IF CABLE IS PERFECT, THE SIGNAL RETURNS WITH KNOWN PROFILE IN A KNOWN TIME.

HIGH VOLTAGE RADAR

REFLECTION METHOD IS APPLIED. IT CAN BE (i) ARC REFLECTION (ii) SURGE PULSE REFLECTION (iii) VOLTAGE PULSE REFLECTION

OPEN NEUTRAL - IF THE NEUTRAL IS OPEN, IT CAN REDUCE THE EFFECTIVENESS OF H.V. RADAR METHOD.

IT NEEDS TO MEASURE THE NEUTRAL RESISTANCE WITH OHM METER. READING 10Ω OR HIGHER INDICATES THAT THERE MAY BE OPEN NEUTRAL

MODERN CABLE FAULT TESTERS

TX 2001 TDR

TX 2002 TDR

TX 2003 TDR