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# Rules of Thumb

## Square Loop - Inductance

1" square loop, ~ 16 GA. Wire

~ 80 nH total or 20 nH/side

As loop size → ∞ → 40 nH/side

## Sphere - Capacitance

$C = 4\pi \varepsilon_0 \varepsilon_R r$

$\varepsilon_0$: 8.9 pF/m

$r$: radius

For 1m radius ⇒ 112 pF

10 cm " ⇒ 11.2 pF

## Disk - Capacitance

$C = 8 \varepsilon_0 \varepsilon_R r$

For 1m radius ⇒ 71.2 pF

About 2/3 of a sphere

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# BREAKDOWN IN AIR

OFFICIALLY $\simeq$ 30 KV/CM (UNIFORM FIELD)

BUT CONDITIONS VARY

1. AIR PRESSURE*/HUMIDITY/ETC.
2. SHARP POINTS CONCENTRATE FIELD

$\therefore$ WE USE 10 KV/CM AS A DESIGN NUMBER

* STORY TO TELL ON HIPOT FAILURE

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# Speed of Light

$$299{,}792{,}458\ m/s \times 1\ s/10^9\ ns \times 39.371\ in/m = 11.81\ in/s$$

$$\approx 0.9833(\ldots33\ldots)\ ft/ns$$

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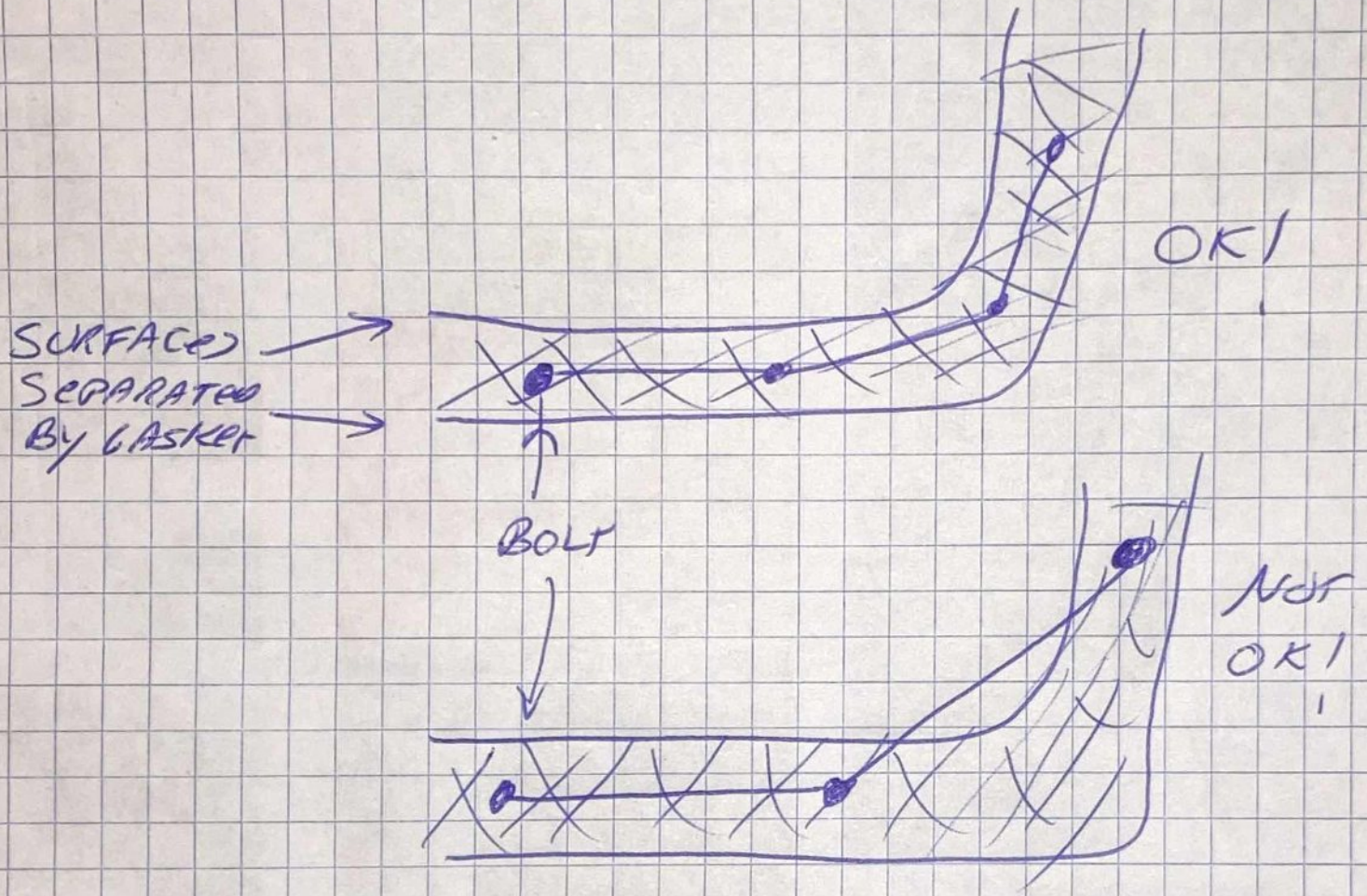
# RULE OF THUMB - EMI GASKET

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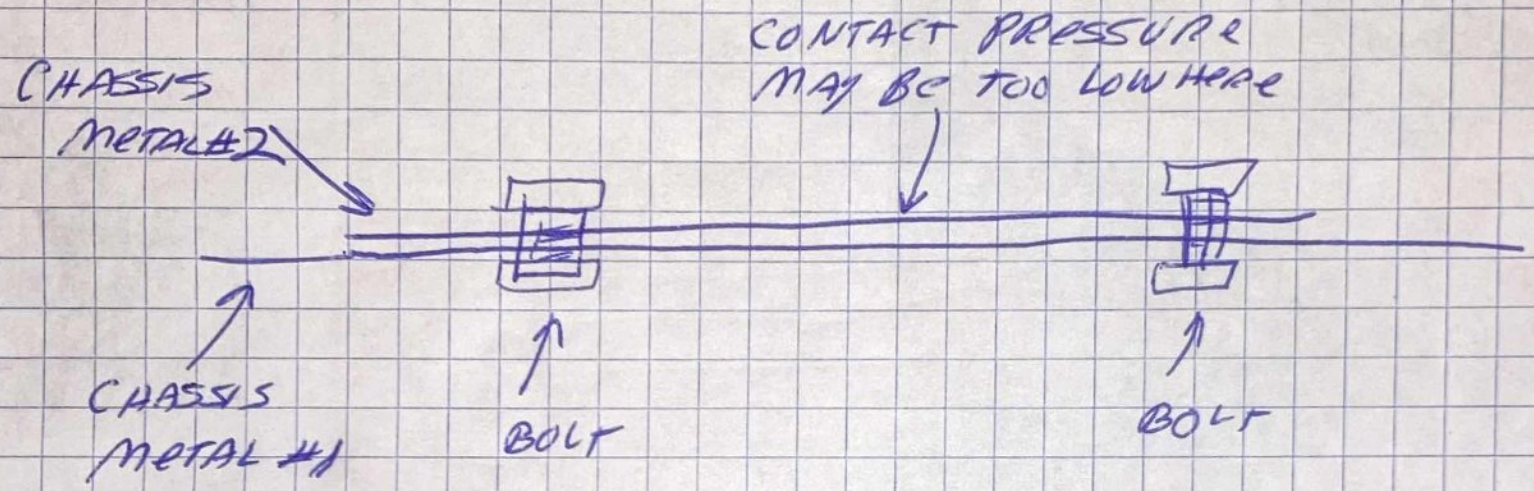
# RULE OF THUMB - CONTACT PRESSURE




NEEDED $\approx 150$ lb/in$^2$ FORCE TO GUARANTEE GOOD CONTACT

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## RULE OF THUMB - BENDING RADIUS

FLEXIBLE COAX ≥ 5X CABLE OUTSIDE DIAMETER [1]

- RG174 *
- RG58 *
- RG142
- RG8 *
- RG214
- RG179
- RG59 *

[1] FOR AIRCRAFT

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# Rule of Thumb - Signal Bandwidth

$$BW \approx \frac{1}{\pi T_R} \approx \frac{1}{3 T_R}$$

$T_R$ ← Signal Risetime

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# SAFETY RULE OF THUMB - HIGH VOLTAGE

- KEEP ONE HAND IN YOUR BACK POCKET TO AVOID A CURRENT PATH THROUGH THE HEART IF A HIGH VOLTAGE CIRCUIT IS TOUCHED!

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