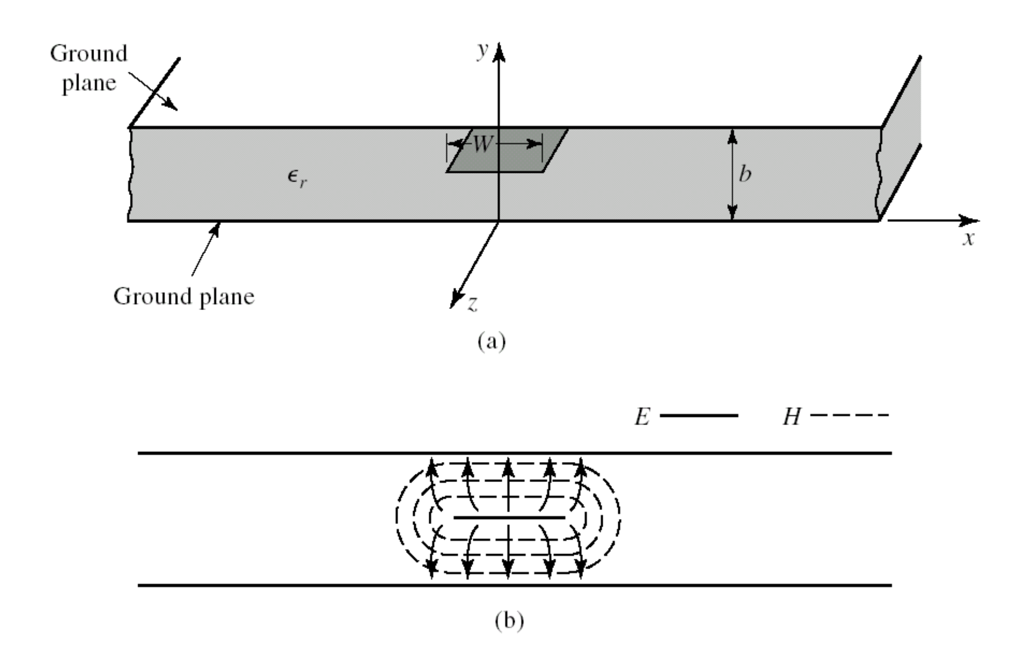
Stripline Transmission Lines

Stripline—a **TEM** transmission line!



The characteristic impedance is therefore:

$$Z_o = \sqrt{\frac{L}{C}}$$

and:

$$\begin{aligned}\beta &= \omega\sqrt{LC} \\ &= \omega\sqrt{\varepsilon\mu} \\ &= \frac{\omega}{c}\sqrt{\varepsilon_r}\end{aligned}$$

However, there are no **exact** analytic solutions for the capacitance and inductance of stripline—they must be numerically analyzed. However, we can use those results to form an analytic **approximation** of characteristic impedance:

$$Z_0 = \frac{30\pi}{\sqrt{\varepsilon_e}} \frac{b/W_e}{1 + 0.441\ b/W_e}$$

where W_e is a value describing the **effective width** of the center conductor:

$$\frac{W_e}{b} = \frac{W}{b} - \begin{cases} 0 & \text{for } W/b > 0.35 \\ (0.35 - W/b)^2 & \text{for } W/b < 0.35 \end{cases}$$

Note that Z_0 is expressed in terms of the **unitless** parameter W/b, a coefficient value **analogous** to the ratio a/b used to describe **coaxial** transmission line geometry.

From the standpoint of stripline **design**, we typically want to determine the value W/b for a desired value Z_0 (i.e., the **inverse** of the equation above). This result is provided by equation 3.180 of your **textbook**.