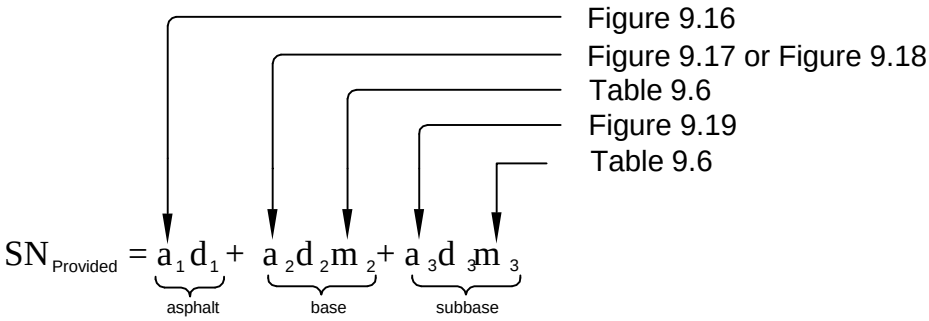
FLEXIBLE (ASPHALT) PAVEMENT DESIGN

Linear Strength Relationship :



d = layer thickness (to nearest 1/2 inch)
a = material strength coefficient
m = moisture modifier (default value = 1.0)

$SN_{Required} \Longrightarrow$ Use Figure 9.15 (Which represents a complicated logarithmic equation)

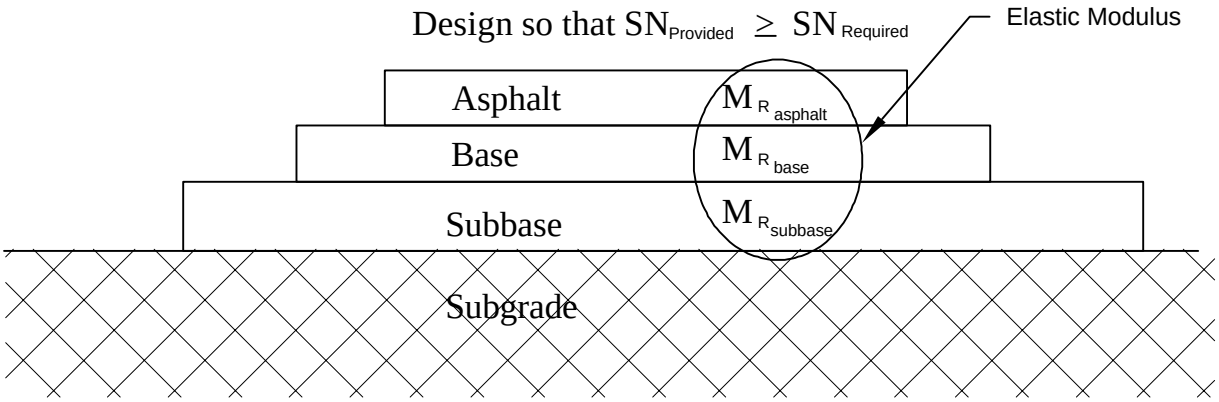
$M_R = CBR * 1500$ OR 5000PSI

$\Delta PSI = 4.5 - 2.5 = 2.0$

$Z_R \leftarrow$ P. 480 Table

$S_0 \leftarrow$ Use 0.35

Design so that $SN_{Provided} \geq SN_{Required}$



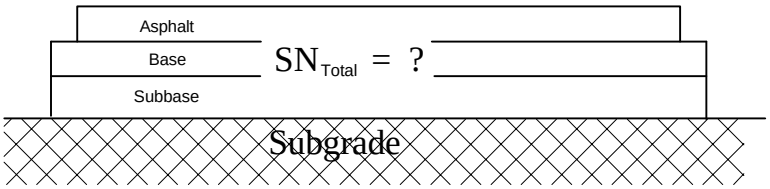
$M_R = CBR * 1500$

Resilient Modulus

9.12

Note : Assume all m_i's = 1.0

(1.) Find Total Required SN



$M_{R_{subgrade}} = 1500 * CBR = 1500(4) = 6000$ PSI

$S_0 = 0.35$

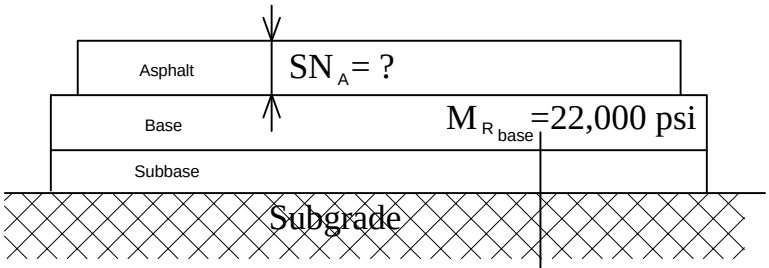
$R = 95\% \longrightarrow Z_R = -1.645$

$ESAL = 39{,}000{,}000$

$\Delta PSI = P_i - P_t = 4.2 - 2.5 = 1.7$

Figure 9.15 $\rightarrow SN_{REQUIRED} = 6.40$

(2.) Find SN for a one-layered pavement resting on the base, then find the thickness of the asphalt



S_0

Z_R

ESAL

ΔPSI

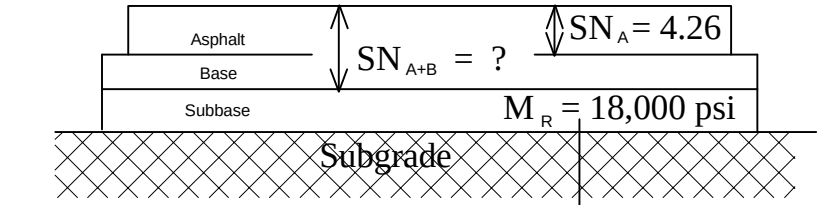
Figure 9.15 $\rightarrow SN_A = 4.19$

$$d_A = \frac{SN_A}{a_A} = \frac{4.19}{0.37} = 11.3'' \rightarrow 11.5''$$

$SN_A = (11.5'')(0.37) = \underline{4.26}$ inches

ALWAYS ROUND UP TO NEAREST 1/2 INCH !

(2.) Find SN for a two-layered pavement resting on the subbase, then find the SN for the base, then find the thickness of the base.



S_0
Z_R
ESAL
ΔPSI

Figure 9.15

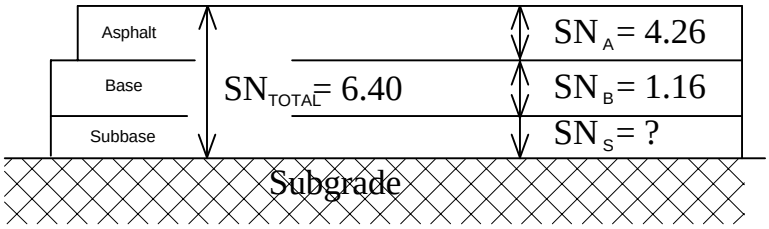
$SN_{A+B} = 5.33$

$SN_B = SN_{A+B} - SN_A = 5.33 - 4.26 = 1.07$

$$d_B = \frac{SN_B}{a_B} = \frac{1.07}{0.21} = 5.09'' \rightsquigarrow 5.5''$$

$SN_B = (5.5'')(0.21) = \underline{\underline{1.16}}$

(4.) Find SN for the subbase, then find the thickness of the subbase.



$SN_S = 6.40 - 4.26 - 1.16 = 0.98$

$$d_S = \frac{SN_S}{a_S} = \frac{0.98}{0.10} = 9.8'' \rightsquigarrow \underline{\underline{10''}}$$

$SN_S = (10'')(0.10) = \underline{\underline{1.00}}$

(5.) Check SN_{TOTAL} :

$$SN_{\substack{TOTAL \\ PROVIDED}} = a_A d_A m_A + a_B d_B m_B + a_S d_S m_S \quad (m_A = 1.0,\ m_B = 1.0,\ m_S = 1.0)$$

$SN_{TOTAL} = SN_A + SN_B + SN_S = 4.26 + 1.16 + 1.00$

$SN_{\substack{TOTAL \\ PROVIDED}} = \underline{\underline{6.42}} \geq SN_{\substack{TOTAL \\ REQUIRED}} = 6.40 \quad \therefore \underline{\underline{O.K.}}$ ✓