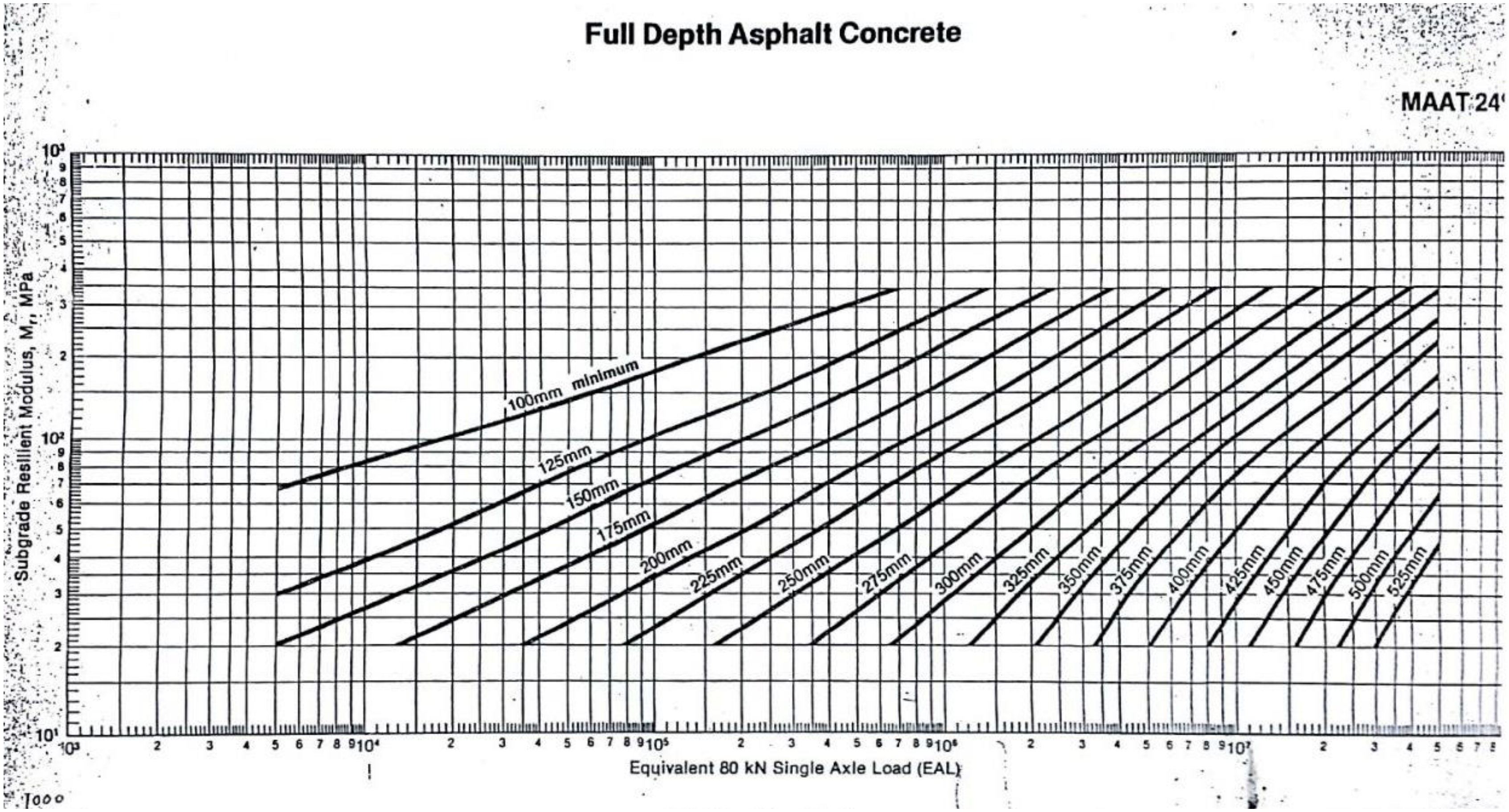
**Asphalt Institute Method:**

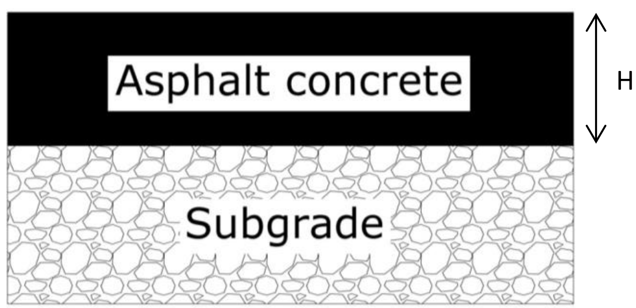
Six cases:

1. Full depth asphalt concrete.
2. Type I: Emulsified asphalt mixes.
3. Type II: Emulsified asphalt mixes.
4. Type III: Emulsified asphalt mixes.
5. Asphalt concrete and untreated aggregate base (Base thickness of 6”).
6. Asphalt concrete and untreated aggregate base (Base thickness of 12”).

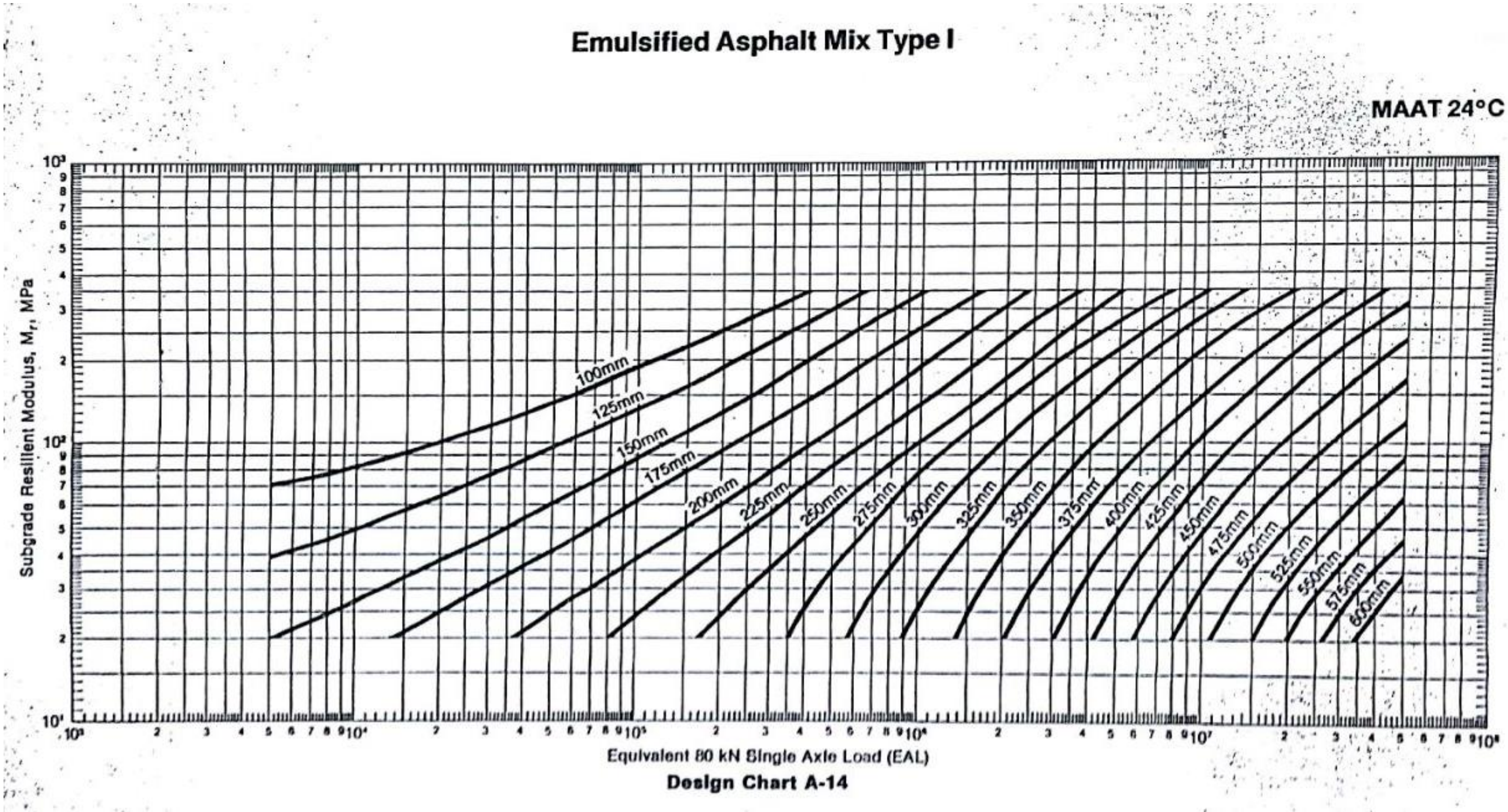
- Using specific charts based on MAAT and design case.
  - Use ESAL on design lane over design period on X axis.
  - Use subgrade resilient modulus on Y axis.
  - Round up to the nearest ½ inch.

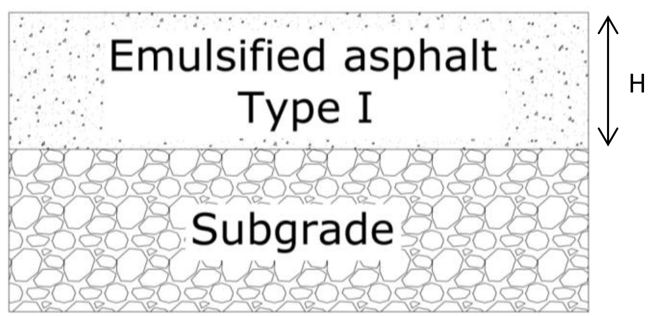
**Full depth asphalt concrete**



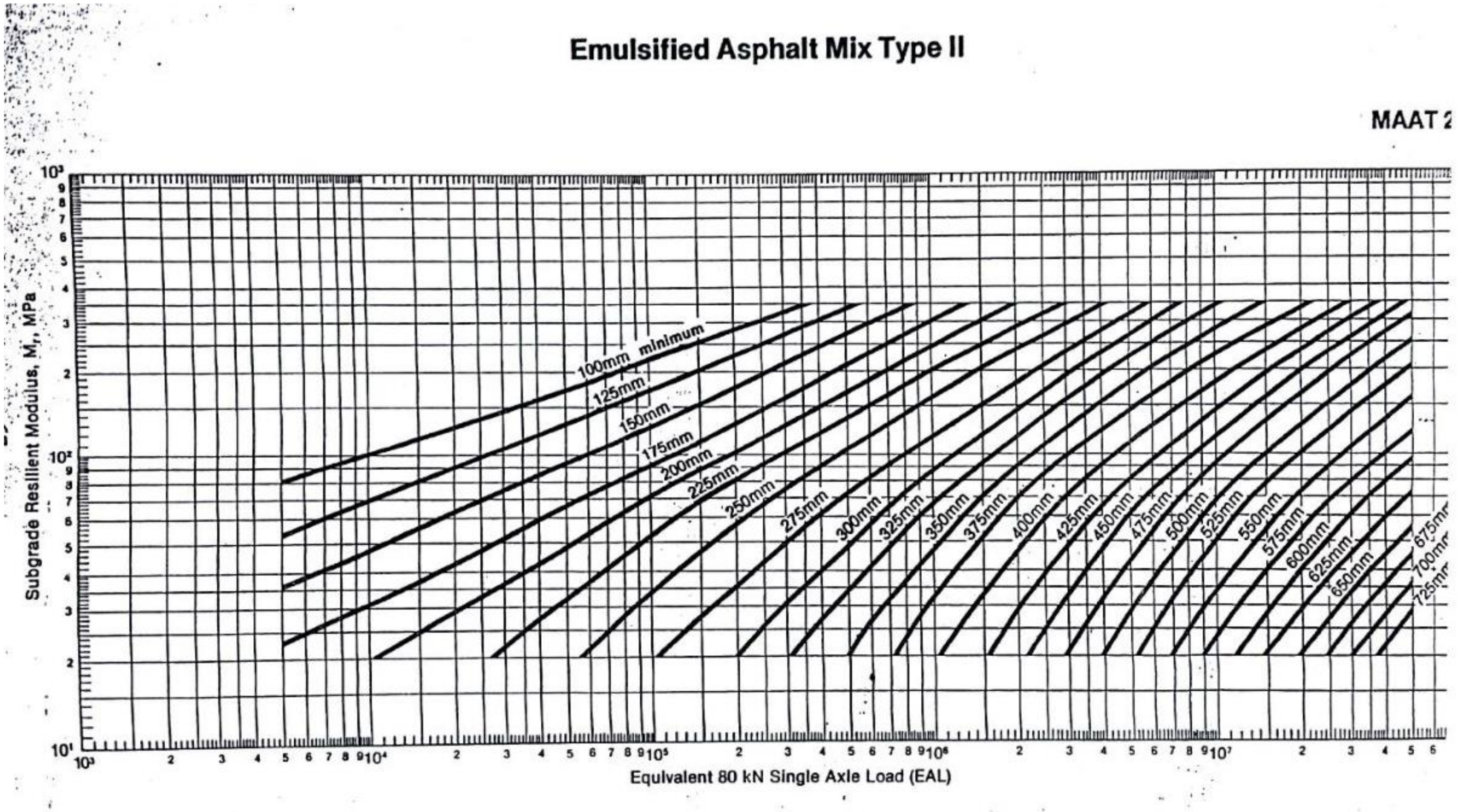



**Type I: Emulsified asphalt mixes**

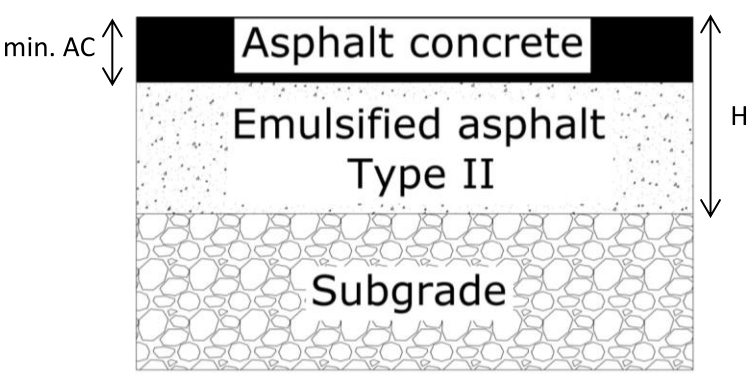


**Type II: Emulsified asphalt mixes**

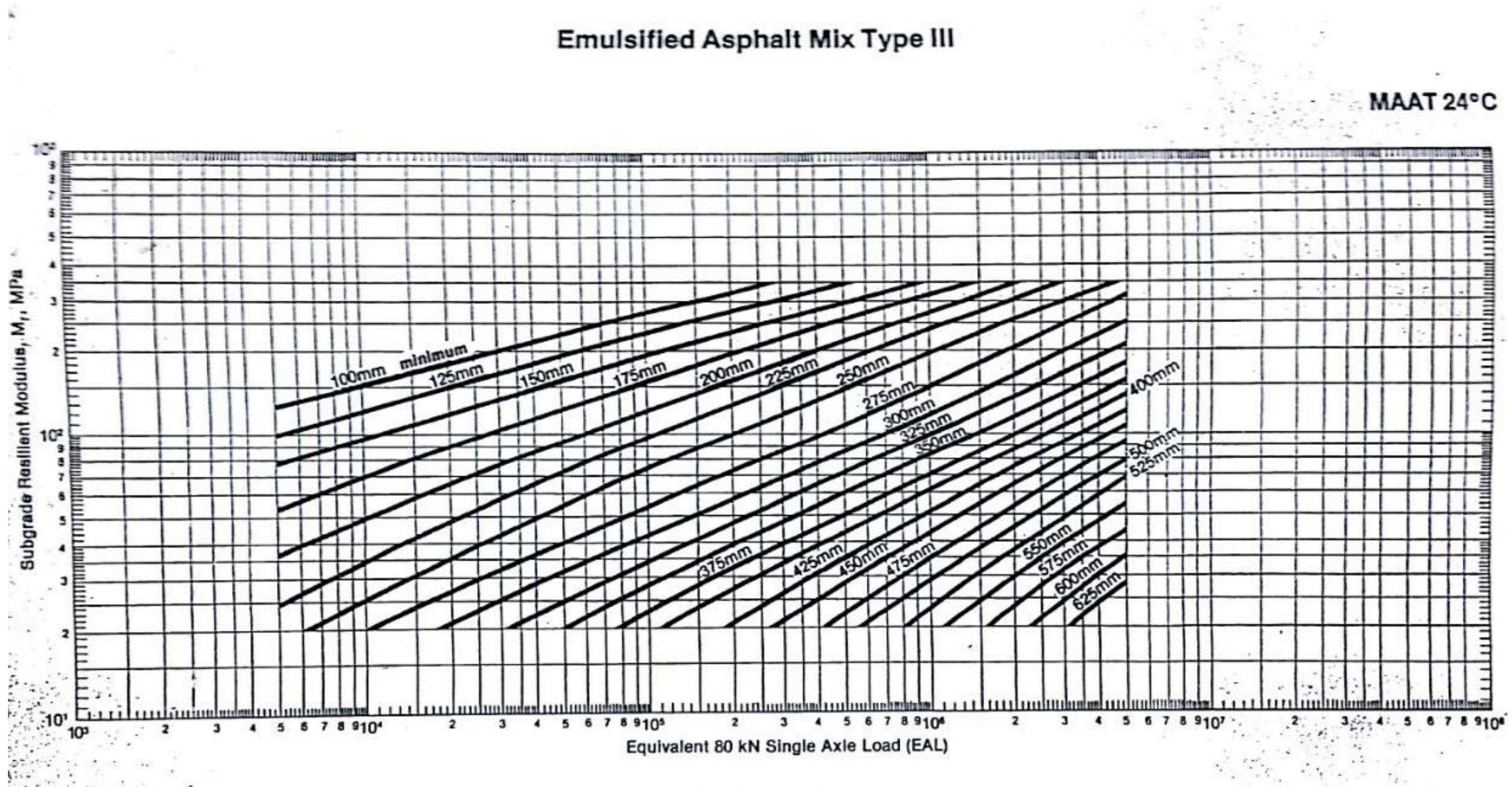



Design Chart A-15

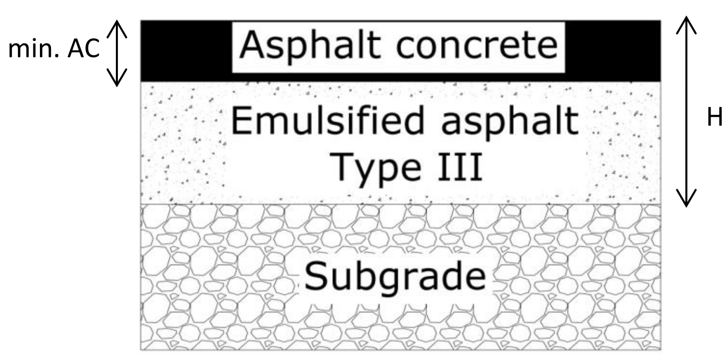



| ESAL | Min. AC Thickness mm (in) over Type II and III Emulsified Asphalt |
|---|---|
| $10^4$ | 50 (2) |
| $10^5$ | 50 (2) |
| $10^6$ | 75 (3) |
| $10^7$ | 100 (4) |
| $>10^7$ | 130 (5) |

**Type III: Emulsified asphalt mixes**

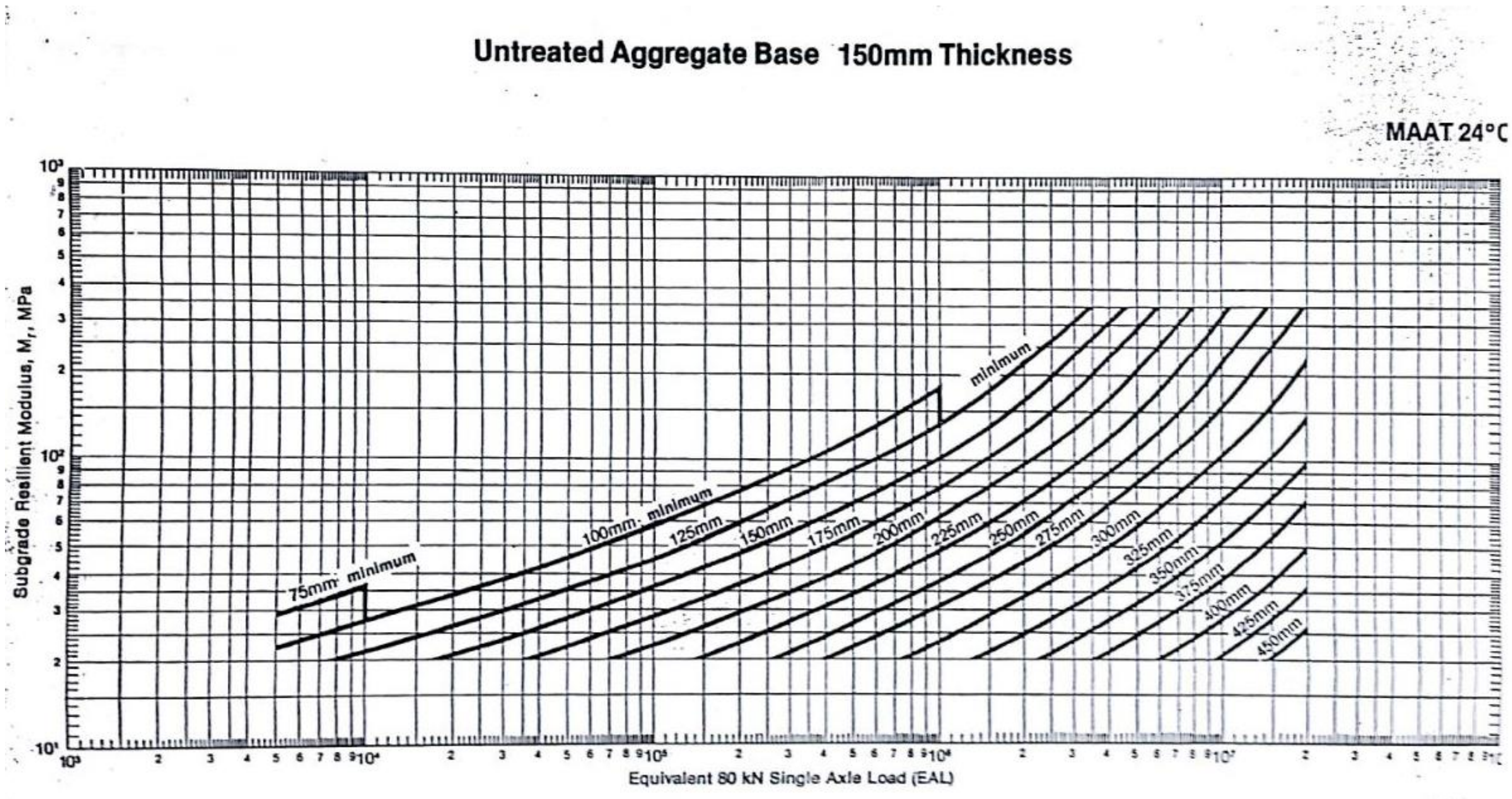



Design Chart A-16

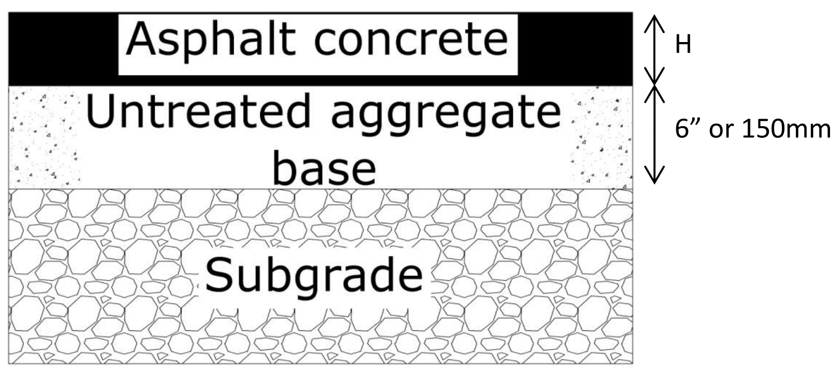



| ESAL | Min. AC Thickness mm (in) over Type II and III Emulsified Asphalt |
|---|---|
| $10^4$ | 50 (2) |
| $10^5$ | 50 (2) |
| $10^6$ | 75 (3) |
| $10^7$ | 100 (4) |
| $>10^7$ | 130 (5) |

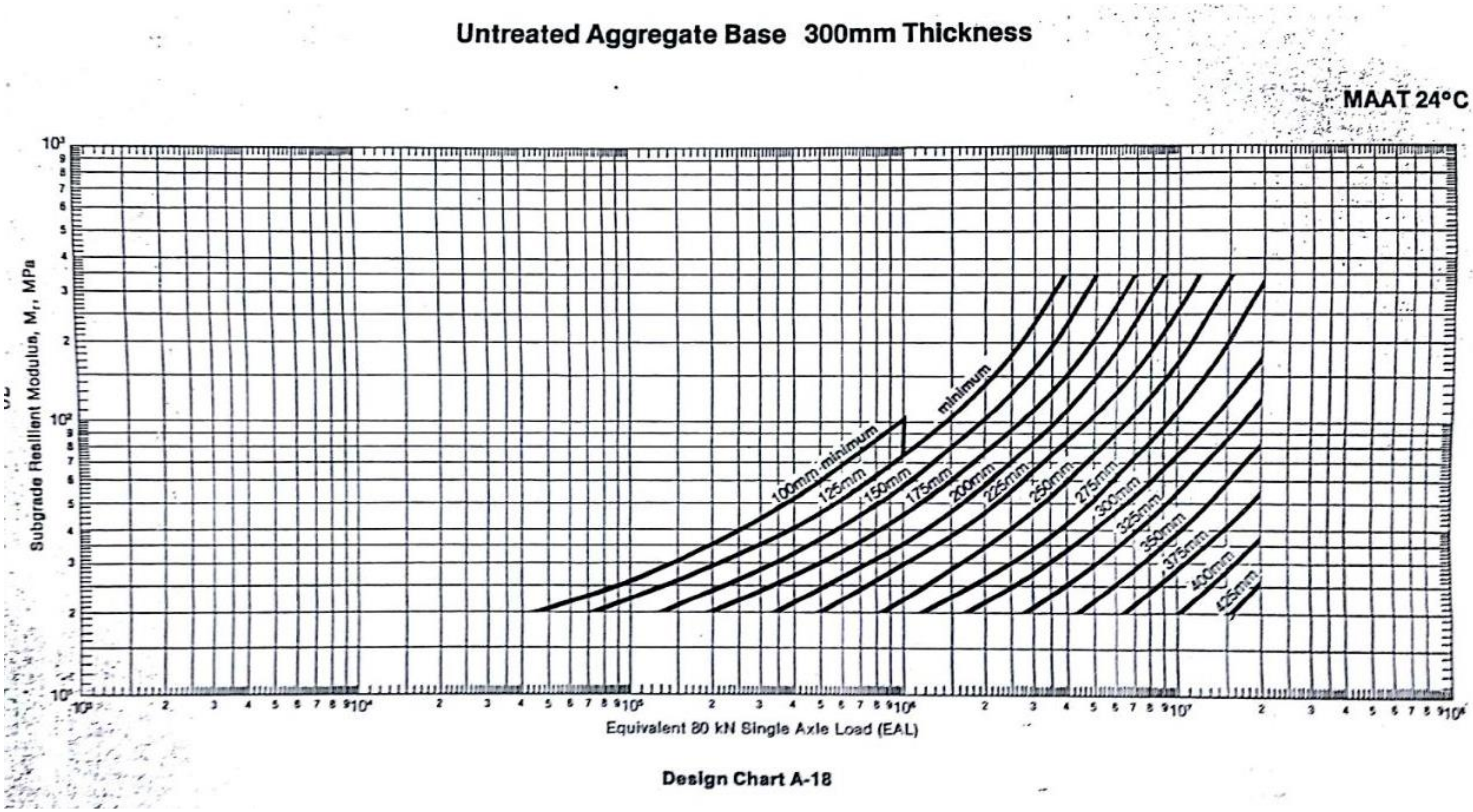
**Asphalt concrete and untreated aggregate base (Base thickness of 6”)**

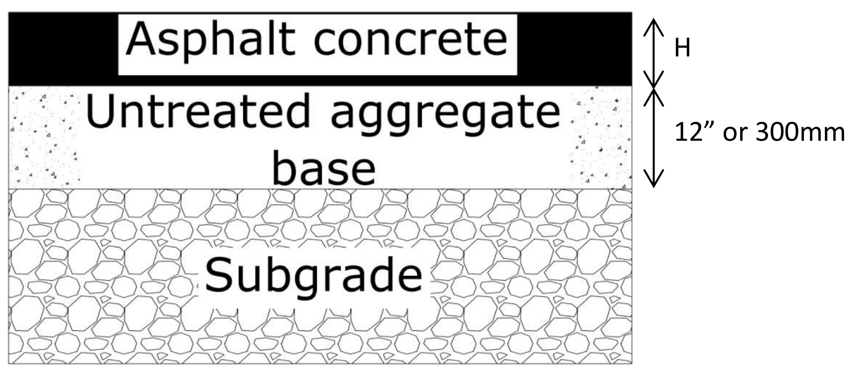



**Design Chart A-17**



**Asphalt concrete and untreated aggregate base (Base thickness of 12”)**



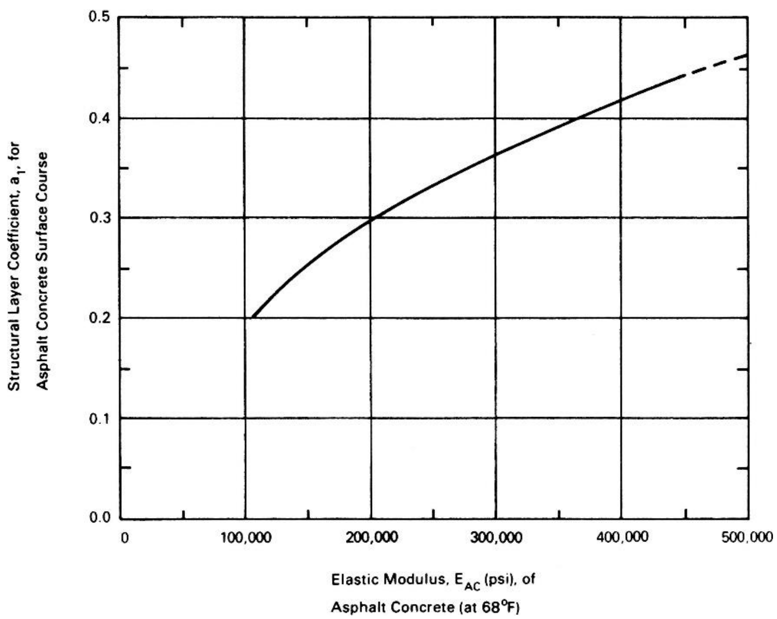
**AASHTO Method:**

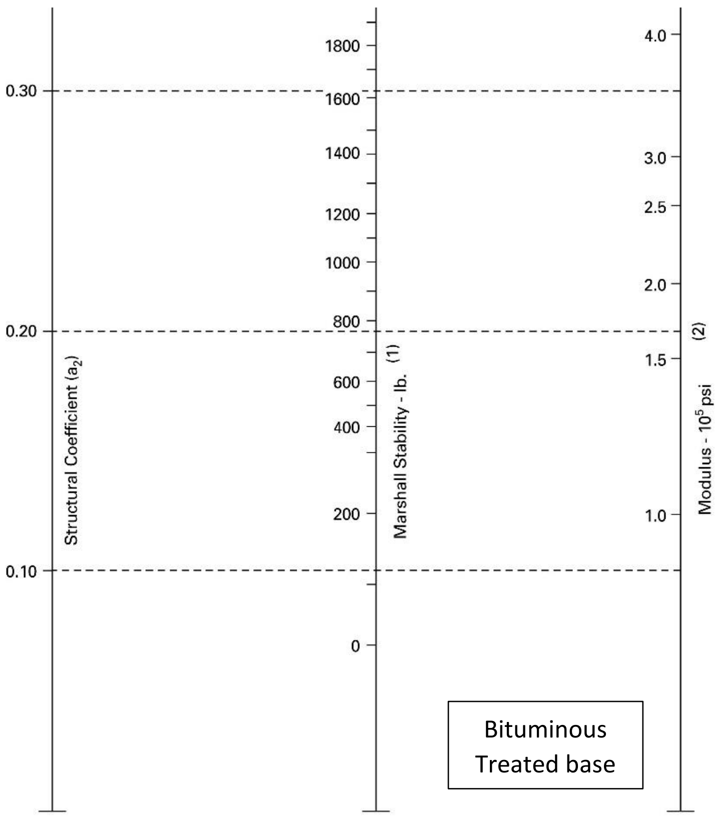
- Used to calculate the depth of each layer. $D_1$, $D_2$, and $D_3$.
  - Structural numbers $SN_1$, $SN_2$, and $SN_3$ using the nomograph based on $M_r$ of the below layer.
  - Find layer coefficients $a_1$, $a_2$, and $a_3$ using charts based on $M_r$ of the same layer.
  - Find drainage modifying factor $m_2$, and $m_3$ using the table based on drainage quality and percentage of exposure.

$$SN_1 \leq D_1 \times a_1$$

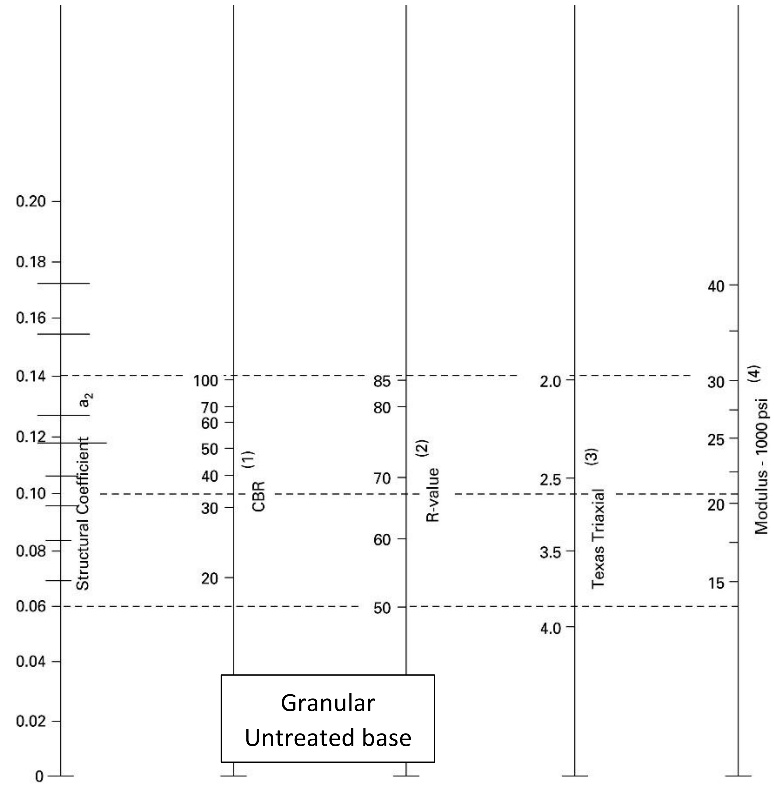
$$SN_2 \leq D_1^* \times a_1 + D_2 \times a_2 \times m_2$$

$$SN_3 \leq D_1^* \times a_1 + D_2^* \times a_2 \times m_2 + D_3 \times a_3 \times m_3$$

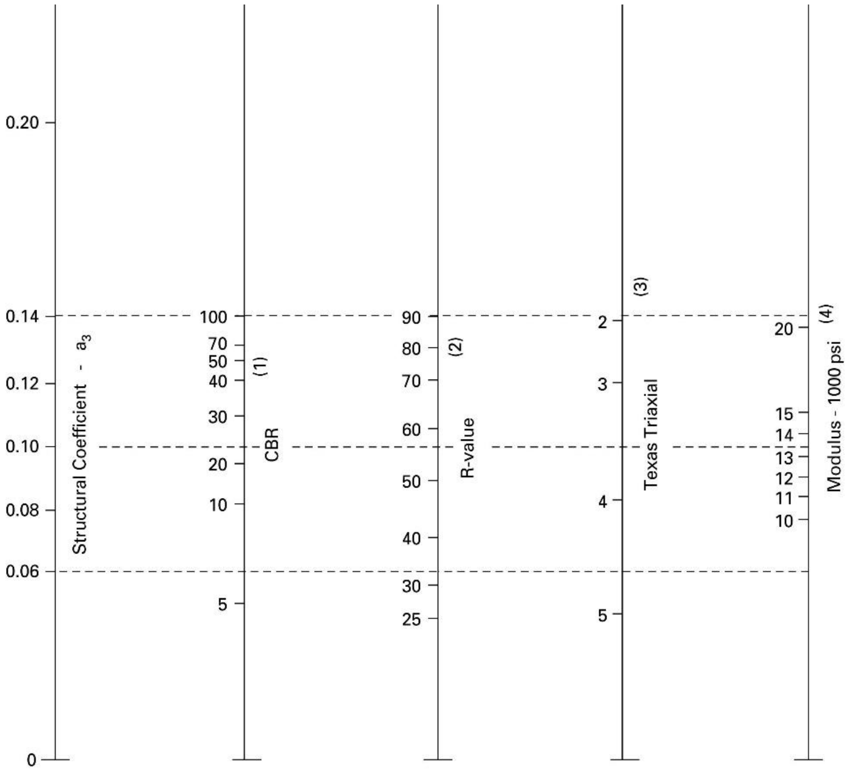




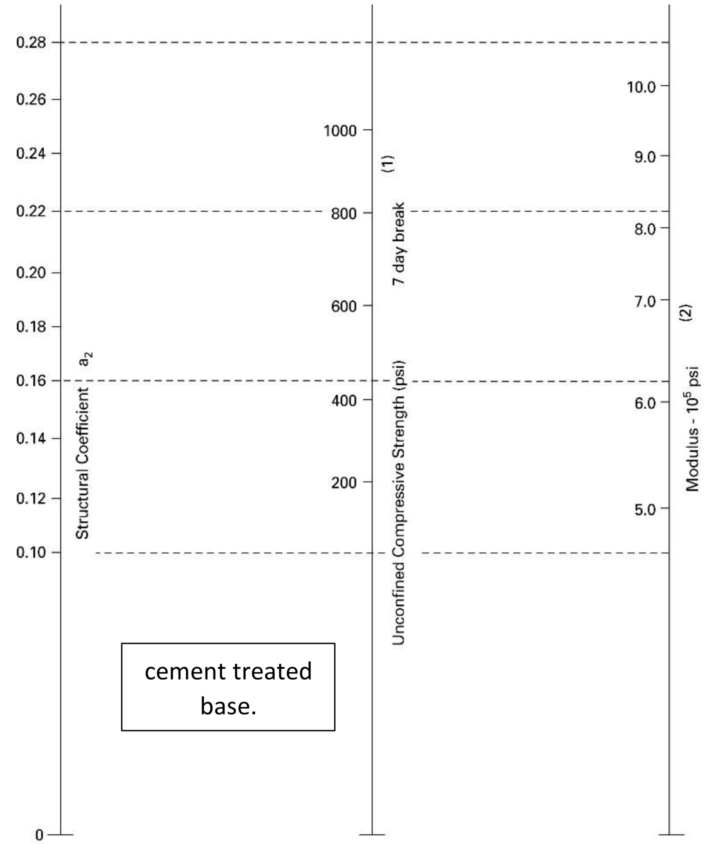

(1) Scale derived by correlation obtained from Illinois.
(2) Scale derived on NCHRP project (4).




(1) Scale derived by averaging correlations obtained from Illinois.
(2) Scale derived by averaging correlations obtained from California, New Mexico and Wyoming.
(3) Scale derived by averaging correlations obtained from Texas.
(4) Scale derived on NCHRP project (4).




(1) Scale derived from correlations from Illinois.
(2) Scale derived from correlations obtained from The Asphalt Institute, California, New Mexico and Wyoming.
(3) Scale derived from correlations obtained from Texas.
(4) Scale derived on NCHRP project (4).




(1) Scale derived by averaging correlations from Illinois, Louisiana and Texas.
(2) Scale derived on NCHRP project (4).

| | *Percent of Time Pavement Structure Is Exposed to Moisture Levels Approaching Saturation* | | | |
|---|---|---|---|---|
| *Quality of Drainage* | *Less Than 1%* | *1% – 5%* | *5% – 25%* | *Greater Than 25%* |
| Excellent | 1.40 – 1.35 | 1.35 – 1.30 | 1.3 – 1.20 | 1.2 |
| Good | 1.35 – 1.25 | 1.25 – 1.15 | 1.15 – 1.00 | 1.00 |
| Fair | 1.25- 1.15 | 1.15 – 1.05 | 1.00 – 0.80 | 0.80 |
| Poor | 1.15 – 1.05 | 1.05 – 0.80 | 0.80 – 0.6 | 0.60 |
| Very poor | 1.05 – 0.95 | 0.95 – 0.75 | 0.75 – 0.40 | 0.40 |

**NOMOGRAPH SOLVES:**

$$\log_{10}W_{18} = Z_R*S_o + 9.36*\log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2 - 1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32*\log_{10}M_R - 8.07$$