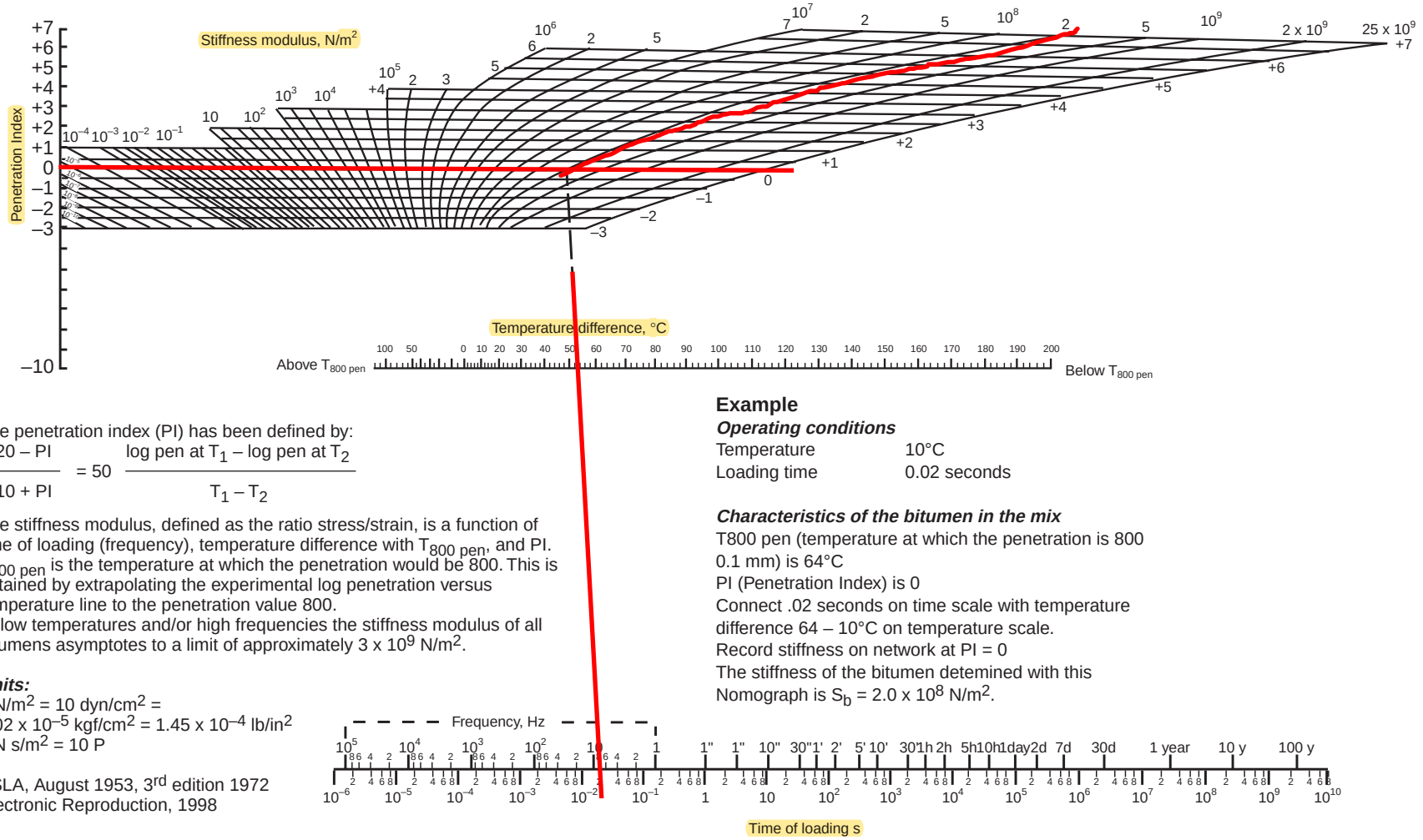
Figure 1: The Van der Poel Nomograph



The penetration index (PI) has been defined by:

$$\frac{20 - PI}{10 + PI} = 50 \frac{\text{log pen at } T_1 - \text{log pen at } T_2}{T_1 - T_2}$$

The stiffness modulus, defined as the ratio stress/strain, is a function of time of loading (frequency), temperature difference with $T_{800\ pen}$, and PI. $T_{800\ pen}$ is the temperature at which the penetration would be 800. This is obtained by extrapolating the experimental log penetration versus temperature line to the penetration value 800.
At low temperatures and/or high frequencies the stiffness modulus of all bitumens asymptotes to a limit of approximately 3×10^9 N/m^2.

Units:
1 N/m^2 = 10 dyn/cm^2 =
1.02×10^{-5} kgf/cm^2 = 1.45×10^{-4} lb/in^2
1 N s/m^2 = 10 P

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Example

Operating conditions

Temperature	10°C
Loading time	0.02 seconds

Characteristics of the bitumen in the mix

T800 pen (temperature at which the penetration is 800 0.1 mm) is 64°C
PI (Penetration Index) is 0
Connect .02 seconds on time scale with temperature difference 64 – 10°C on temperature scale.
Record stiffness on network at PI = 0
The stiffness of the bitumen detemined with this Nomograph is $S_b = 2.0 \times 10^8$ N/m^2.