CE 361

In-Class Design Problem #4:
Pavement Design

For this exercise, you are to design a northbound section of interstate that is to carry 150,000 travelers a day (**excluding truck occupants**). The vehicles that carry these people include; (1) personal vehicles (average occupancy of 1.2 people per car) 2-2 kip single axles, and (2) buses with 2-22 kip single axles (assume they are filled with an average of 40 passengers). There are also trucks on the roadway and all trucks have 1-40 kip triple axle, 1-32 kip tandem axle, and 1-8 kip single axle. You know that the soil CBR is 6, the initial PSI is 4.5 and the TSI is 2.5. Other values to be used:

- All drainage coefficients = 1.0
- Reliability = 90%
- Overall standard deviation of traffic = 0.50
- Concrete Modulus of Elasticity = 5.5 million lb/in^2
- Concrete Modulus of Rupture = 750 lb/in^2
- PCC load transfer coefficient = 3.0

Design a rigid and flexible pavement, to last 15 years, for a four-lane road (four lanes in the northbound design direction) with 600 trucks per day in the design direction, and 5% of all travelers going by bus (the rest go in personal vehicles).

Sketch cross-section of your two pavement designs and show all parameter assumptions. Do not forget to determine the amount of traffic that will be in the "design-lane" before beginning your computations (see Table 4.10).

Procedure:

- Determine W_{18} for rigid and W_{18} for flexible (they will not be the same). Assume SN =4 and D =10 to get the axle-load equivalence factors.

- Determine design lane W_{18} for 4 lanes (design conservatively). See Table 4.10.

- For flexible pavement, select layer materials and thicknesses using Eq. 4.3 $\mathrm{SN} = a_1 D_1 + a_2 D_2 M_2 + a_3 D_3 M_3$. Assume all but one D, and solve for it (as done in Example 4.1 on page 110).

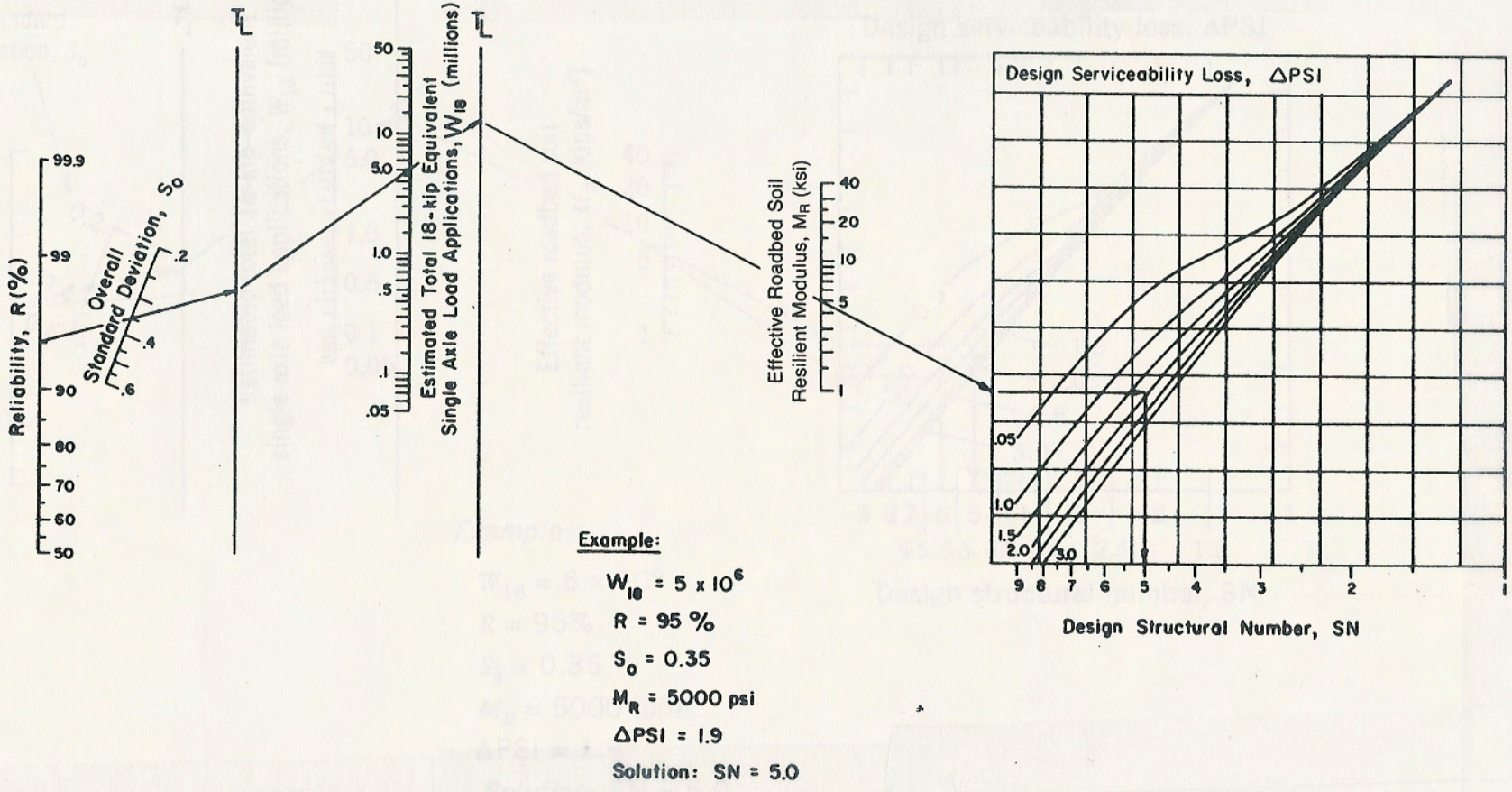

Figure 4.5 Design chart for flexible pavements based on the use of mean values for each input.

Redrawn from *AASHTO Guide for Design of Pavement Structures*, Washington, DC, The American Association of State Highway and Transportation Officials, 1993. Used by permission.

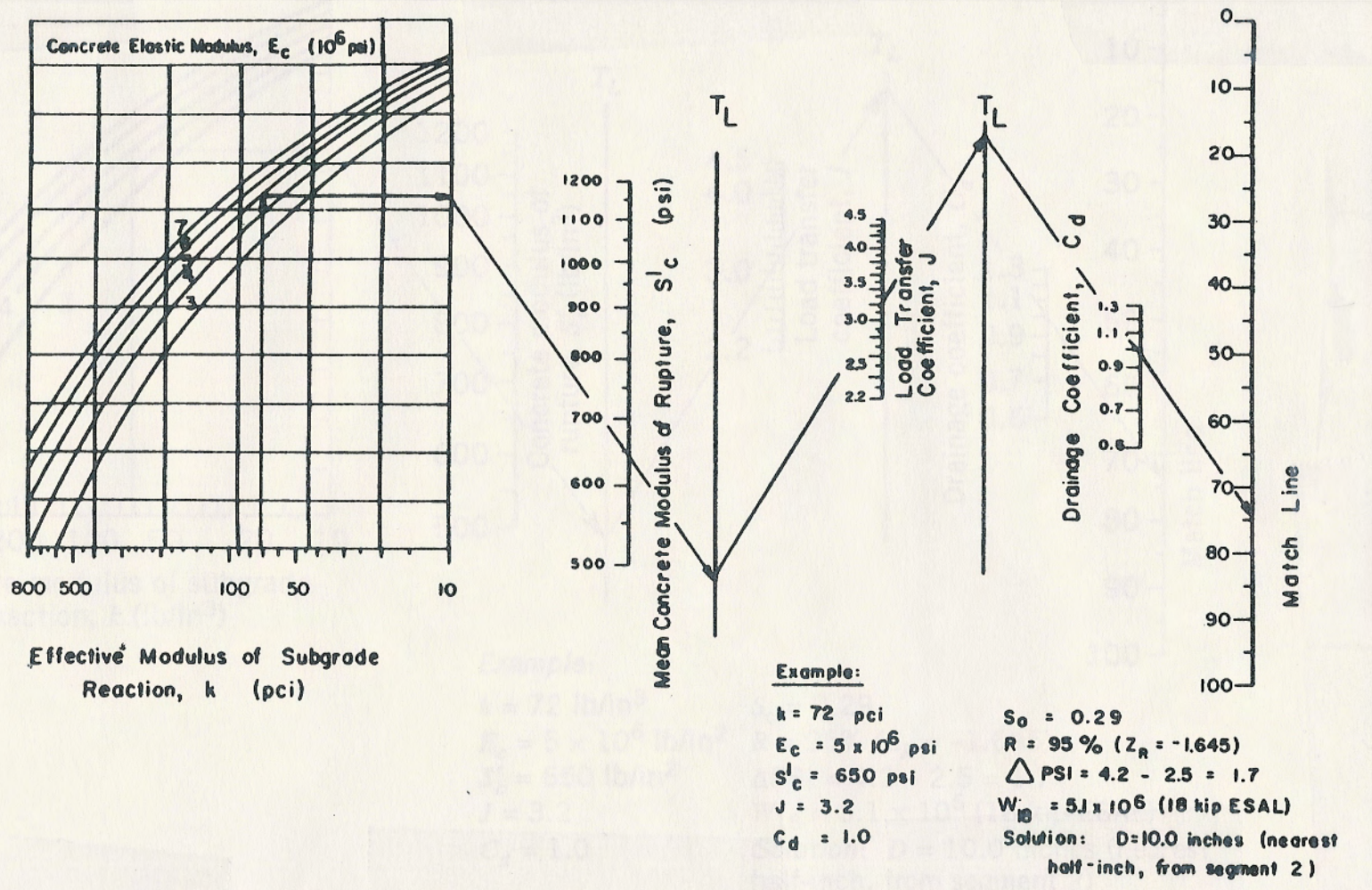

Figure 4.7 Segment 1 of the design chart for rigid pavement based on the use of mean values for each input variable.

Redrawn from *AASHTO Guide for Design of Pavement Structures*, The American Association of State Highway and Transportation Officials, Washington, DC, 1993. Used by permission.

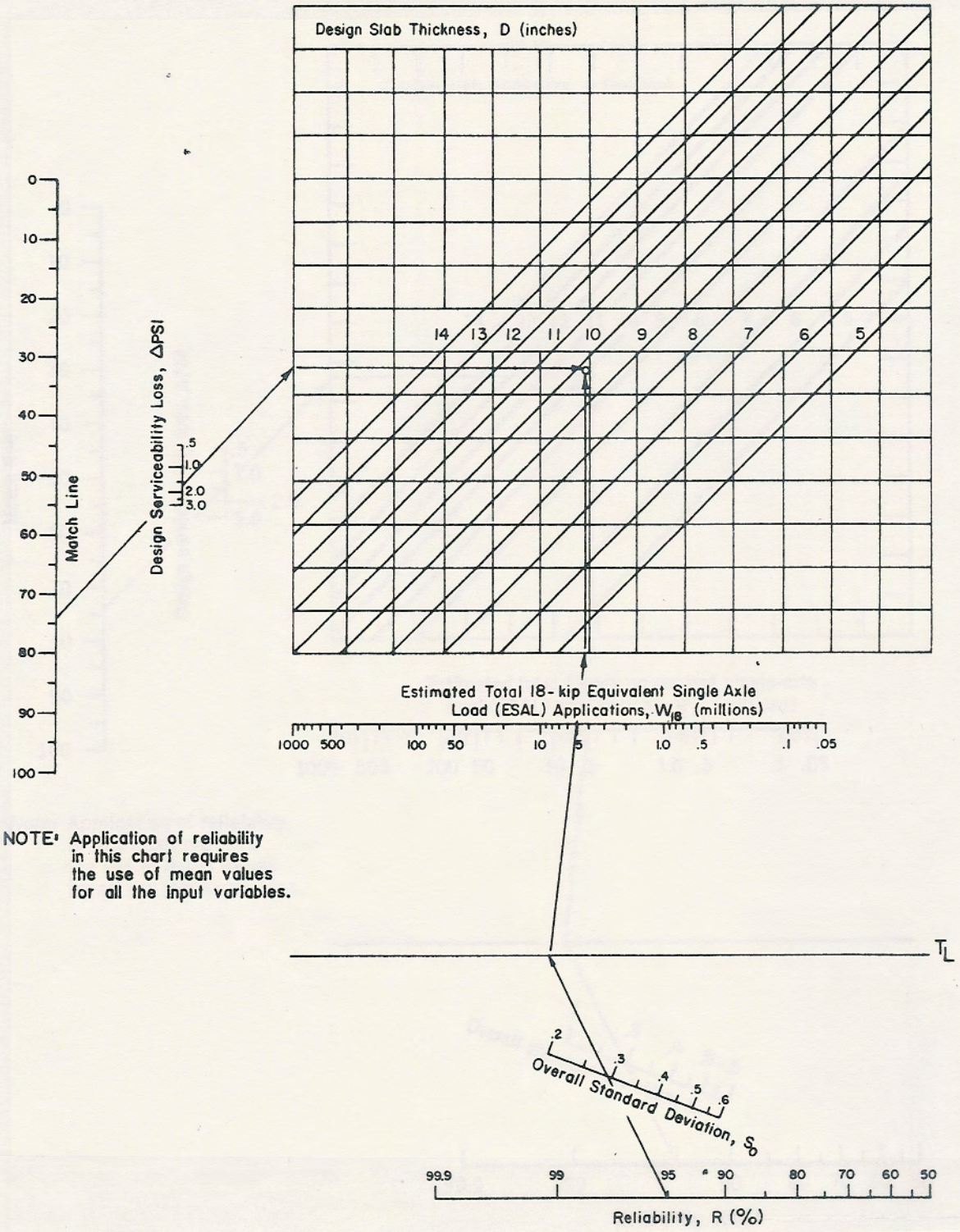

Figure 4.8 Segment 2 of the design chart for rigid pavement based on using mean values for each input variable. Redrawn from *AASHTO Guide for Design of Pavement Structures*, The American Association of State Highway and Transportation Officials, Washington, DC, 1993. Used by permission.