Level II Approach

The solution to the HMA overlay thickness determination used in the Level II approach is an enhanced engineering analysis of the Level 1 tabular solution procedure. In the Level II approach, the engineer is required to determine or select specific design input values for the following variables:

ESAL: Design traffic value
h_{PCC} = PCC slab thickness (inches)
M_r: Design subgrade modulus
SN_{sb}: Subbase layers structural numbers

ESAL: Design Traffic Value

The design traffic for Level II analysis is based upon the expected equivalent single axle loads (ESAL) anticipated during the design period for the overlay. ESAL is a widely used and accepted industry standard for quantifying traffic loads. The values used in the graphs are million equivalent single axle loads (MESAL).

M_r: Design Subgrade Modulus

The subgrade support is characterized by the resilient modulus parameter, M_r. It is difficult to use lab results of resilient modulus tests directly into the solution procedure. Correlations between conventional subgrade design parameters such as CBR and R-value to the resilient modulus value of subgrade soils have been established. Figure 4.3 illustrates these correlations. However, some agencies are developing experience and confidence in performing resilient modulus testing. If lab or field (FWD) estimated resilient modulus data are available that represent a cross section of materials for the project, they may be used in lieu of the correlation to other properties. It is recommended that the correlation be used to verify the lab test properties.

SN_{sb}: Subbase Layer Structural Number

The structural number of the subbase (SN_{sb}) is the sum of the structural number for each layer of subbase. This structural number is determined by multiplying the structural layer coefficient of the material (a_{sb}) by the layer thickness in inches. Detailed guidance for the selection of these values is contained in the AASHTO Guide for the Design of Pavement Structures. For unbound granular layers, it is important to adjust the a_{sb} by the AASHTO drainage coefficients, m_{sb}.

For treated subbase layers, difficulties arise in the selection of an appropriate design a_{sb} value. The engineer must evaluate the probable loss of structural capacity in the original (as-built) pavement layer due to subsequent damage incurred during the previous performance life of the pavement. It is likely that some additional damage will occur to the stabilized layer during the rubblization process. As a result, typical values of a_{sb} for cement and asphalt treated materials used in new construction must be reduced accordingly to compensate for possible loss of strength. If specific information is not available, the engineer can use the procedure discussed for Level I to determine the Structural Number of the subbase layers.

Level II Graphical Solution for Thickness Design

The graphical solution to overlay thickness design provides a simple method with minimal input requirements. To determine the overlay thickness:

- Select the appropriate chart based on the thickness of the rubblized concrete and structural number of the subbase (SN_{sb}).
- Draw a vertical line upward from the subgrade modulus value until it intersects the traffic value.
- Draw a horizontal line from this intersection to the y-axis, and read the overlay thickness required.

Figure 4.7 illustrates the use of the graphical solution.

The example shown is for the following conditions:

PCC type: JPCP (jointed plain concrete pavement)
Fracture mode: Rubblization
PCC thickness: 8.0 inches
Design traffic: 50 MESAL
Subgrade modulus: 7 ksi
Total subbase SN: SN_{sb} = 1.2
HMA Overlay Thickness = 8.5 inches

Figure 4.7
Example Level II design

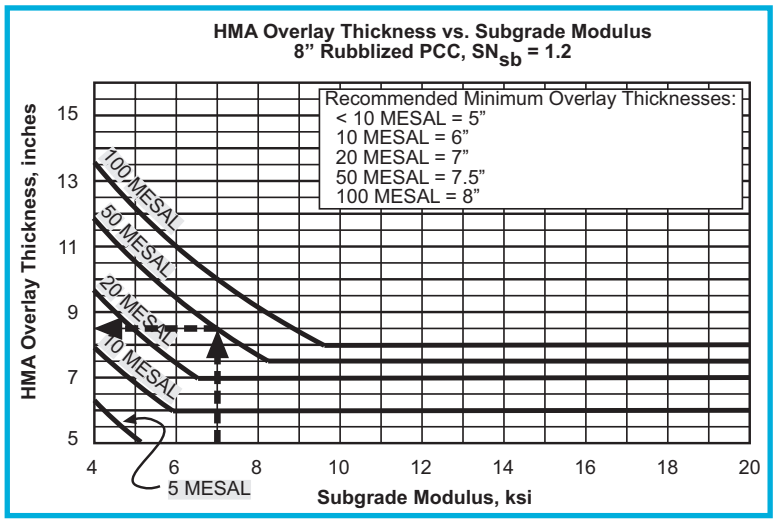

Figure 4.8
Level II overlay design charts 7” rubblized PCC

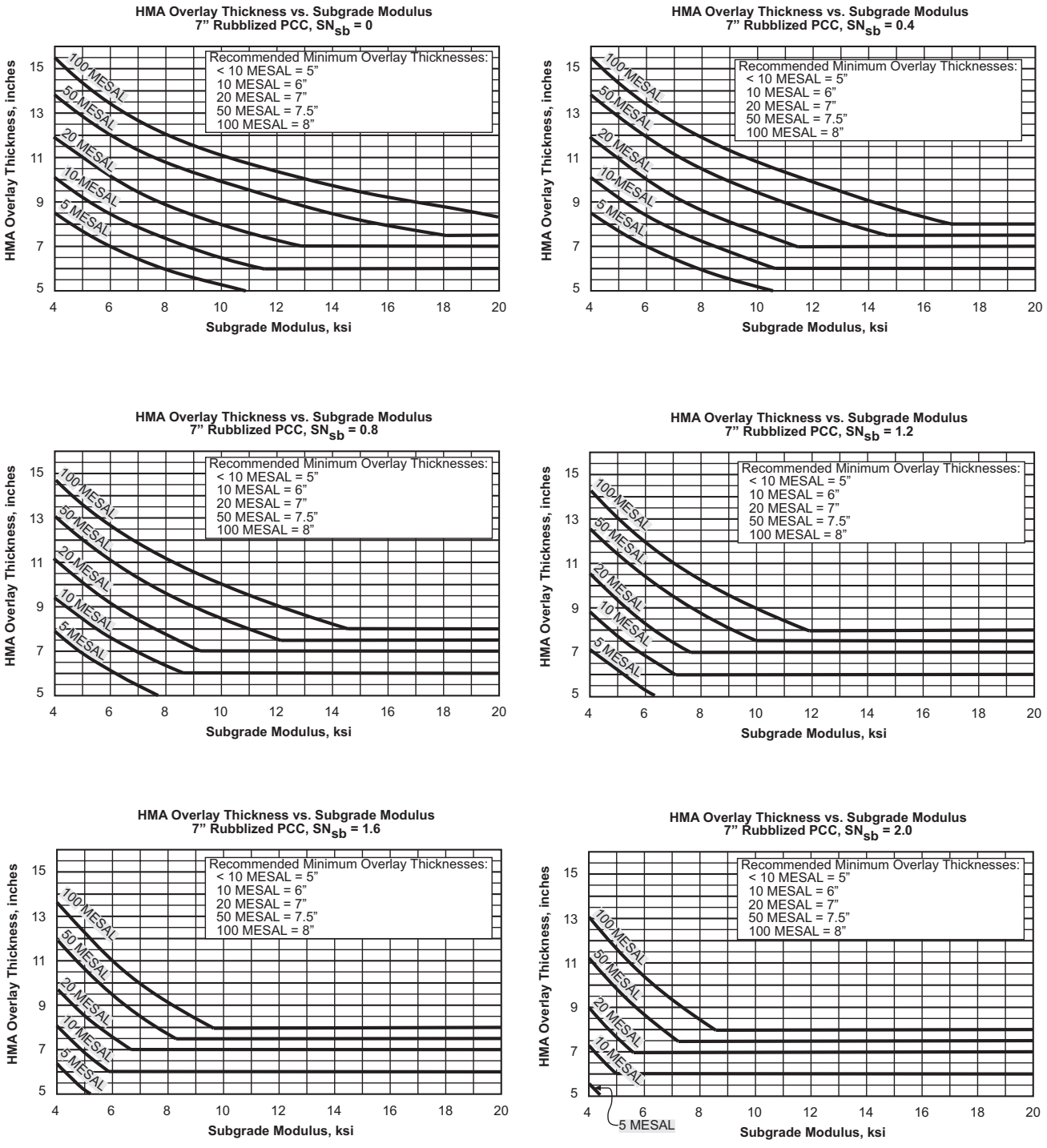

Figure 4.9
Level II overlay design charts 8" rubblized PCC

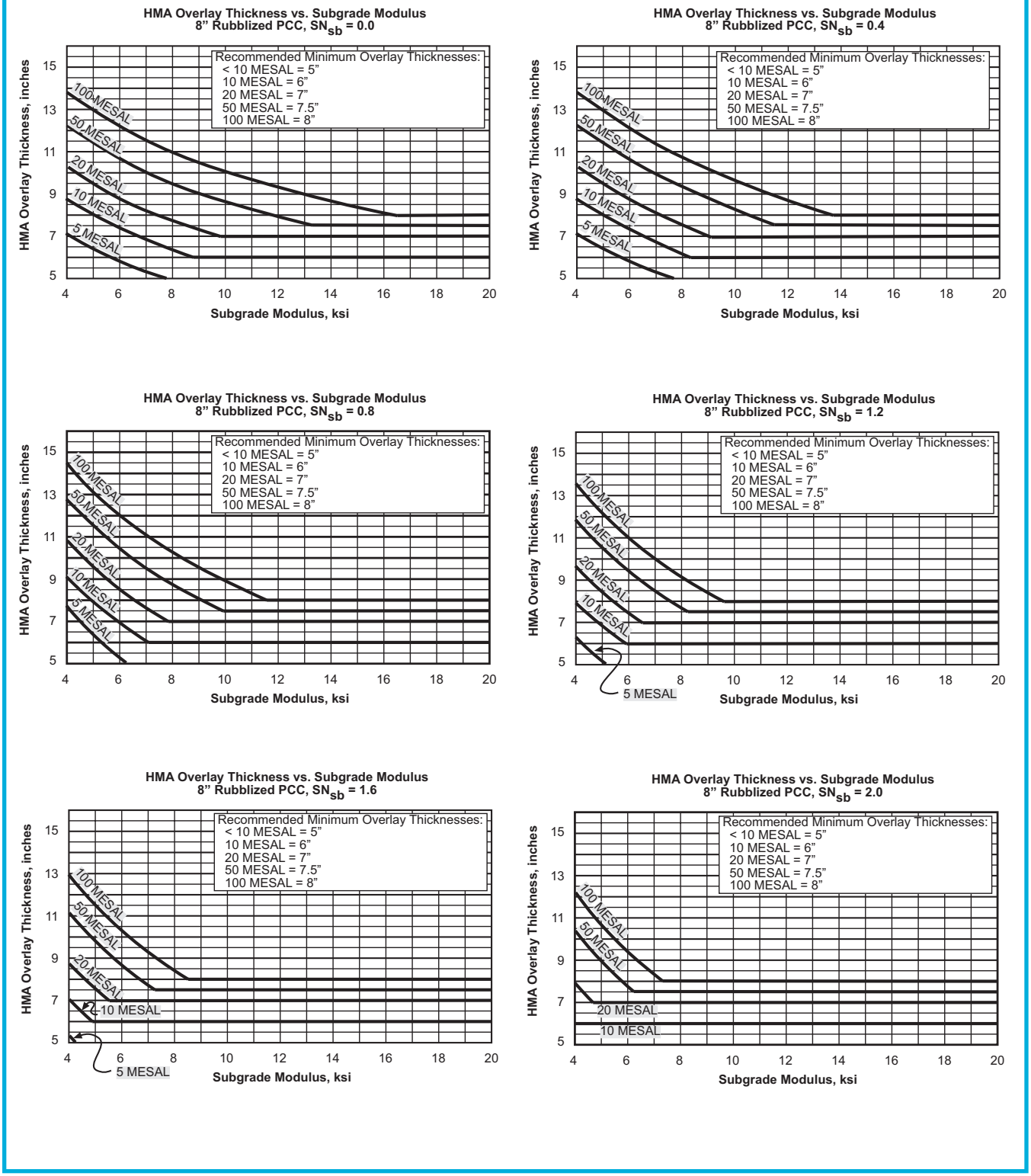

Figure 4.10
Level II overlay design charts 9” rubblized PCC

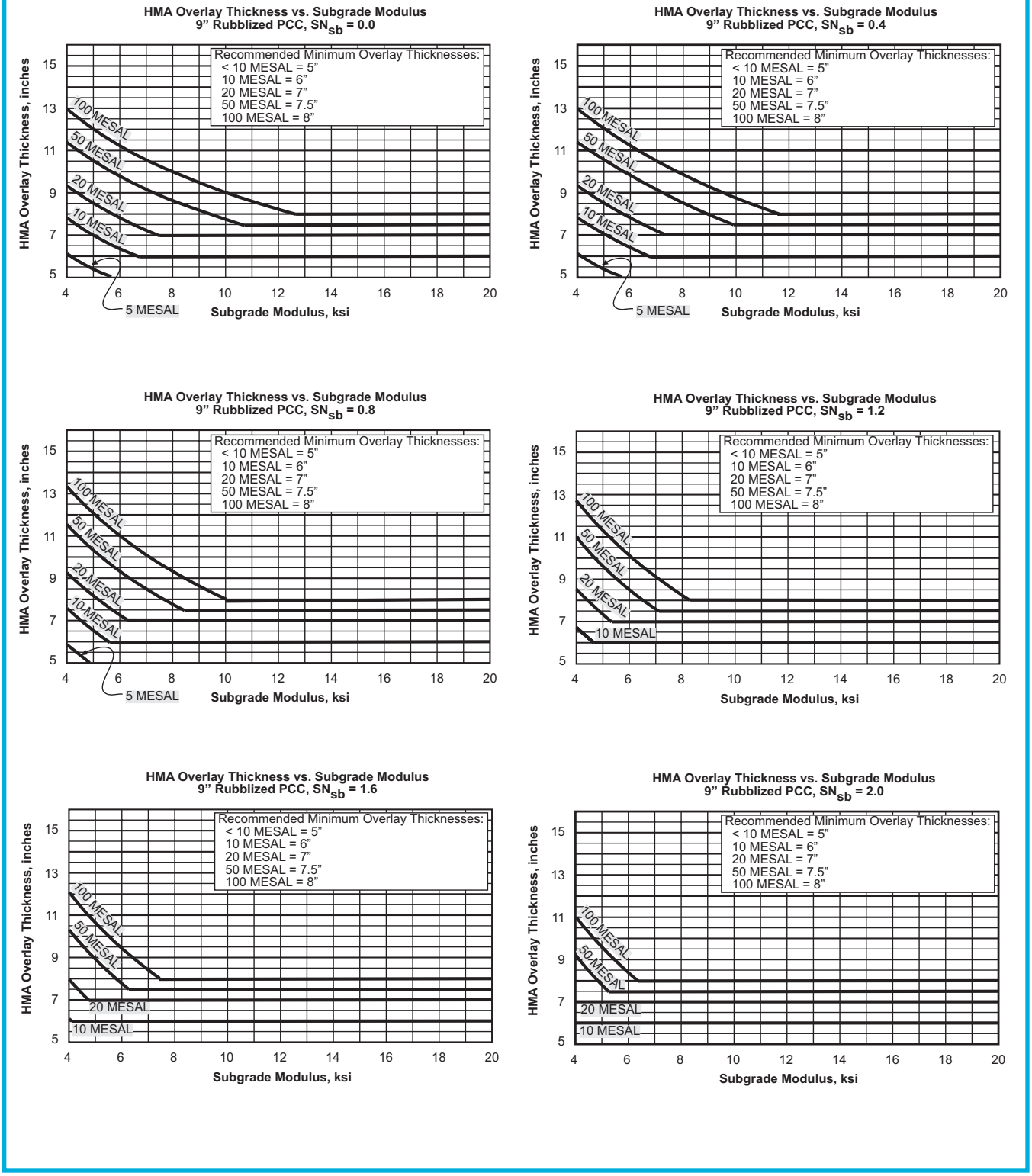

Figure 4.11
Level II overlay design charts 10” rubblized PCC

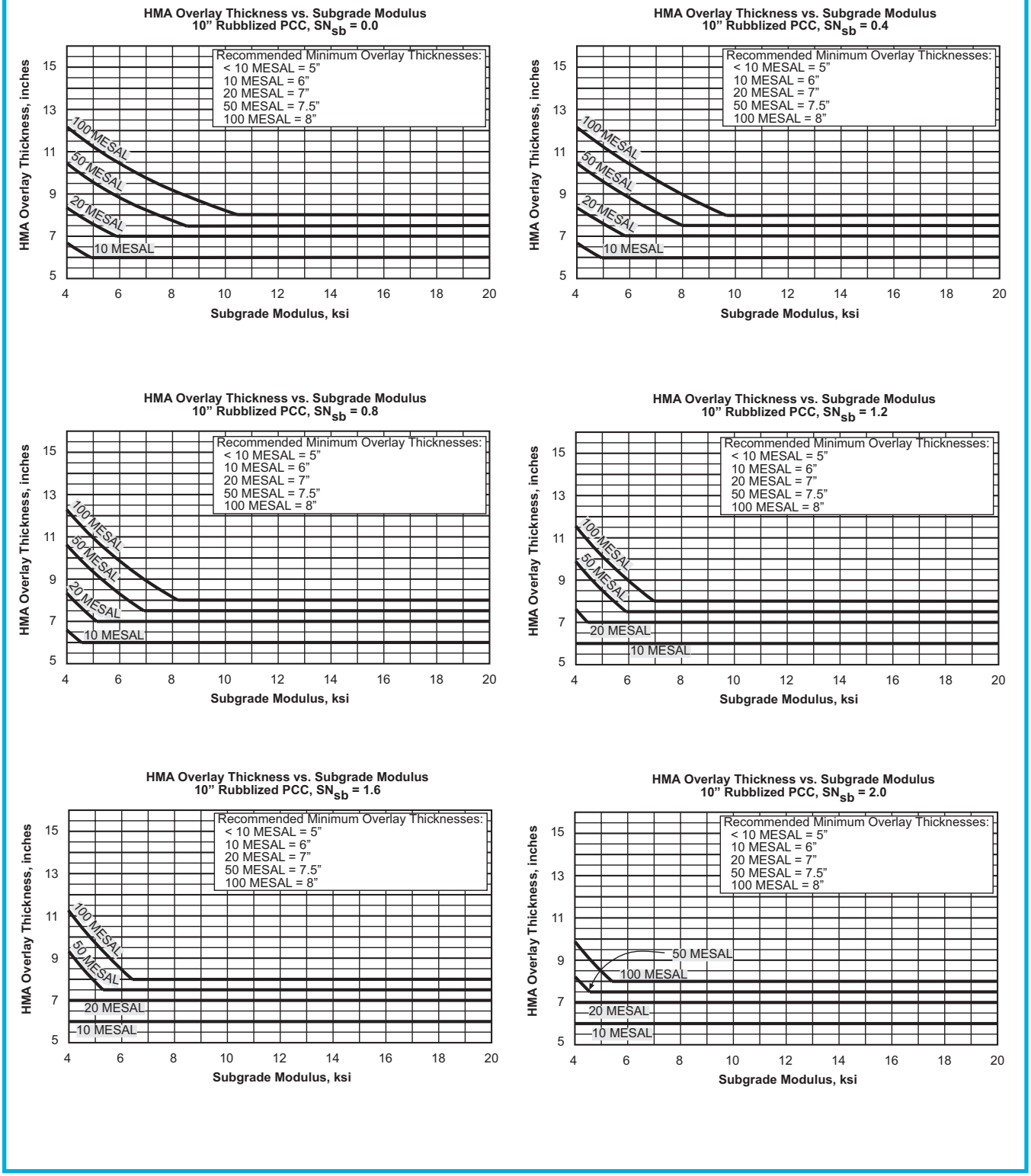

Figure 4.12
Level II 0verlay design charts 11" rubblized PCC

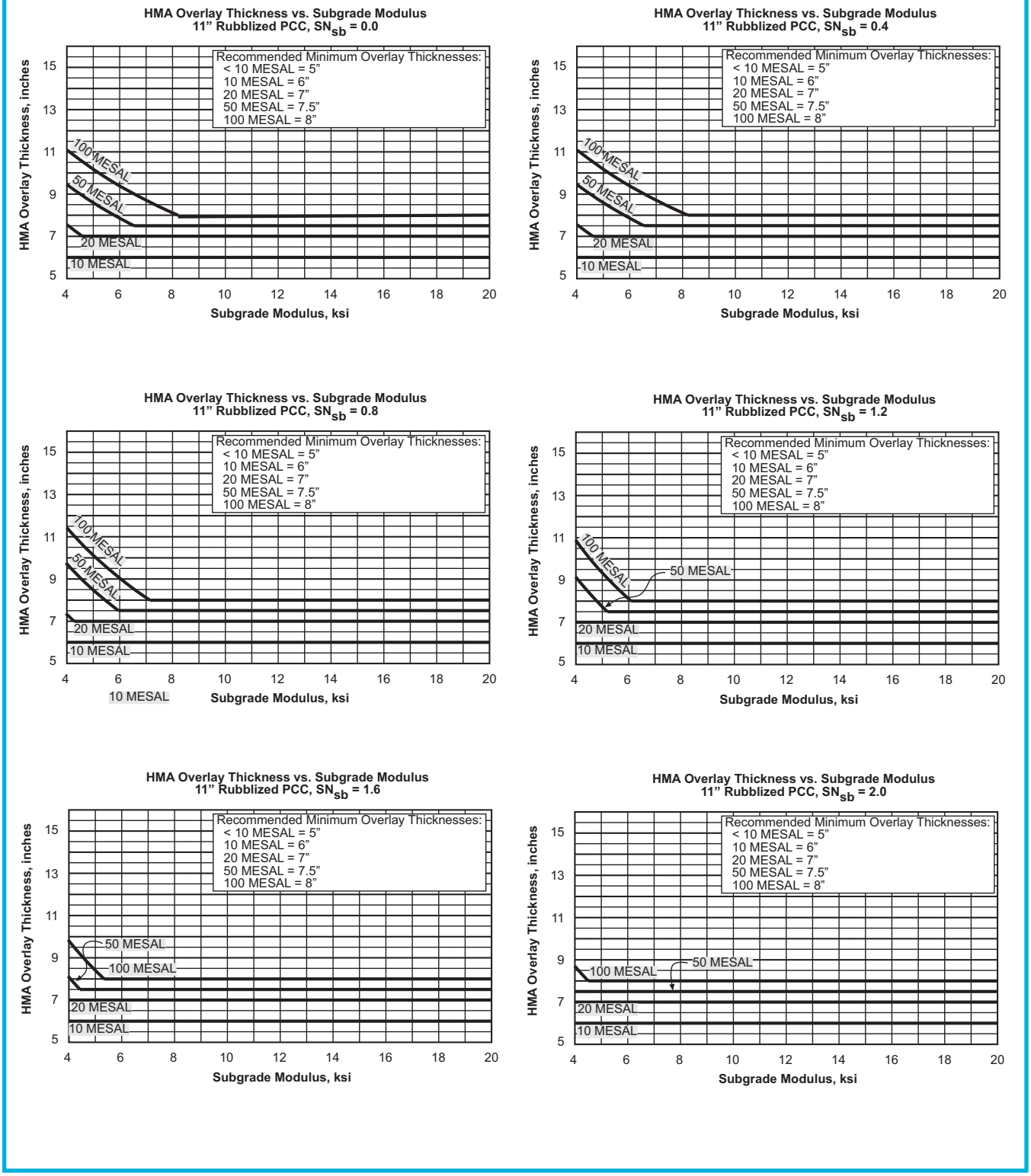

Figure 4.13
Level II overlay design charts 12” rubblized PCC