OBJECTIVE: To develop an HMA mix design following Superpave test protocols.

EQUIPMENT: Brookfield viscometer, gyratory compactor, balance, ovens.

PROCEDURES:

Part A - Viscosity Measurements

1. Prepare a vial of binder and place in thermocell chamber and bring the temperature up to to 135 °C.

2. Collect viscosity readings in Pa-s at two or more rotational speeds.

3. Elevate the binder temperature to approximately 160 °C.

4. Collect viscosity readings in Pa-s at two or more rotational speeds.

Part B - Gyratory Compaction Analysis

1. Prepare a 4500 g specimen of HMA and heat in oven for 2 hours at the desired compaction temperature.

2. Transfer the specimen to the gyratory compactor and compact to a gyration level of Ndesign.

3. Extrude the specimen and place on a flat surface to cool.

4. After cooling, obtain the mass of the compacted specimen in air, in the SSD state, and submerged under water.

5. Repeat Steps 1 - 4 for each replicate specimen.

6. Prepare a 2000 g specimen of uncompacted HMA and obtain the mass in air and submerged under water.
CEEN 043 - Behavior & Properties of Engineering Materials  
Laboratory Experiment No. 6 - Superpave Mix Design

CALCULATIONS:

1. Using the viscosity data, prepare a plot of viscosity vs temperature and recommend appropriate mixing and compaction temperatures.

2. Using the supplied aggregate data, compute the gradation of each aggregate blend and plot on a 0.45 Power chart. Comment on the suitability of each aggregate blend as compared to Superpave specifications provided.

3. Using the supplied compaction and volumetric data, estimate the binder content necessary to achieve 4.0% air voids @ Ndes as well as the estimated % Gmm @ Nini, % VMA, %VFA and DP @ Ndes.

4. Based on the estimated binder content to achieve 4% air voids @ Ndes, compute the HMA mixture costs ($/ton) for each trial blend.

REPORT:

Your lab team is charged with the design of a Superpave mix that would be suitable for the upper layer of a pavement which is expected to carry 1.5 million ESALs over its 20-year design life. Your report should provide a summary of the results of your Superpave testing and spreadsheet analysis and should recommend a trial blend for further analysis. Your report should also provide a description of additional testing that would be required to verify the selected trial blend does indeed meet specifications.

For consistency, specific aggregate, binder and compaction data have been provided. These data should be used during your analysis. Actual data from your lab testing should be included as an appendix to your report and you should comment on differences/similarities between your data and those provided.
### Viscosity Readings

<table>
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<tr>
<th>Test Temperature, °C</th>
<th>Rotational Speed, RPM</th>
<th>Viscosity, Pa-s</th>
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