Use of RAP in the Mix: RAP (waste asphalt) provides many benefits:
- Decrease in cost of construction,
- Decrease in cost of operation,
- Reduce disposal of materials,
- Preserve aggregate, asphalt binder and energy (contribute to sustainability),
- Reduce the greenhouse gas emissions.

For a reliable pavement design using the AASHTO Mixture design program, the inputs for asphalt mixes and binders should reflect the actual properties of the mixes used.

The default inputs for asphalt mix and binder in the AASHTO Mixture Design Program do not include the properties of mixes that contain RAP. The properties of these mixes must be determined through laboratory testing for use in the design program.

2. Project Description and Inputs Data

Use of RAP in Hot Mix Asphalt (HMA) provides many benefits such as the dynamic modulus, creep compliance, and indirect tensile strength (ITS) test have been determined for several lab and field asphalt mixes collected from road PTH 8 (Manitoba).

Table 1 shows the project traffic and climate for the project section:
- annual average daily truck traffic (AADTT): 60
- truck mix design (TMD) loading: 20
- grinding: 20

The project structural thickness are shown in Figure 1.

3. Materials Properties

Materials properties of different layers (subgrade, subbase, base, binder course and surface course) are presented in Table 3.

Table 4: Unbound materials properties

4. Results

Table 6: Pavement ME output for different RAP percentages

5. Conclusion

All the mixes passed the asphalt concrete shear band cracking (3-angle shear cracking) and bottom-up cracking (Alligator cracking) criteria with 100% reliability. The bottom-up fatigue cracking decreases with increase in RAP contents.

The predicted rutting in AC and total pavement layers met the criteria for all the mixes. However, the predicted AC rutting and total rutting criterions by increasing the amount of RAP in mix.

A change to SL due to variable in RAP contents is negligible. This is expected because negative influence on thermal cracking is compensated by positive influence on cracking and fatigue cracking.

The predicted thermal cracking exceeded the target in the first year after pavement construction. This indicates that the virgin asphalt used for the mix design was still for dry climate.

Thermal cracking increased dramatically for high RAP mixes compared to mixes containing 0% and 10% RAP.

Table 8: Pavement ME output for different RAP percentages