CHAPTER 5 CONCLUSION

From the test results and analyses performed in this study, the following conclusions can be derived:

1. The strength value of the vertically compacted PMA specimen was higher than the horizontally compacted PMA specimen. This trend of behavior was also the case for the E_{50} value. Also, the deformation of vertically compacted PMA specimen at which the maximum stress exhibited was smaller than the horizontally compaction PMA specimen.
2. Compressive strength and stiffness of PMA noticeably increased with an increase in its density. Therefore, the importance of compaction on PMA to obtain higher density is significant to make an increase in the durability and strength capacity of PMA.
3. Vertical equivalent elastic modulus, $E_{v,eq}$,for all PMA densities investigated in this study which determined from minute-amplitude unload and reload cycles applied after sustained loading increased with an increase in vertical stress, σ_v. Also, the horizontal equivalent elastic modulus, $E_{h,eq}$, increased with an increase in the horizontal stress, σ_h. At the same stress level, the $E_{v,eq}$ -value was always higher than $E_{h,eq}$ -value. This shows the anisotropy in the stiffness of PMA.
4. The equivalent Poisson's ratio of the vertically compacted PMA specimens (ν_{vh}) decreased with an increase in vertical stress, σ_v. Also, the equivalent Poisson's ratio of the horizontally compacted PMA specimens (ν_{hv}) decreased with an increase in the horizontal stress, σ_h. At the same stress level, the ν_{vh} -value was always higher than ν_{hv} -value. This shows the anisotropy in the deformation characteristics of PMA.
5. The equivalent elastic modulus, $E_{v,eq}$ and $E_{h,eq}$ exhibited significant dependency on the void ratio. The elastic behavior of PMA may significantly depend on the mobilized friction between the aggregate particles. On the other hand, the equivalent Poisson's ratio was not. The $\nu_{vh,eq}$ -values and $\nu_{hv,eq}$ -values significantly exhibited dependency with σ / σ_{max} only, independent of density and void ratio.
6. The strength and deformation behavior of PMA were not equal between different directions of compaction. Therefore, the behaviors of strength and deformation of PMA are anisotropic. The difference of the compressive strength of PMA between two different directions was about 11%. In terms of cross-anisotropy, the inherent anisotropic ratio ($E_{v,eq} / E_{h,eq}$) was 1.12 and the stress level dependency parameter (*m*) was 0.438.
7. The E_{eq} and ν_{eq} of PMA were greater than the E_{eq} and ν_{eq} of HMA for all densities when considering at the same direction of compaction. Also, when compared with other geomaterials (Hime gravel and Toyoura sand), it was found that the PMA had the E_{eq} and ν_{eq} greater than the geomaterials. This shows that PM-AC could develop strength and stiffness properties of asphaltic concrete.

8. The E_{eq} normalized by void ratio function of PMA specimen was higher than the E_{eq} normalized by void ratio function of HMA specimen for about 1.6 times. It could be seen that, this is the order that indicates the stiffness performance of using PM-AC when compared with using ordinary AC.
9. The PMA exhibited significant anisotropic behaviors due to different directions of compaction. Therefore, PMA should be treated as an anisotropic material for a more realistic analysis.

Recommendations for Future Research

1. Mixing of PMA at the high temperature (more than the manufacturer's recommendation) should be performed for studying the stress-strain and strength properties which have been affected by the effect of higher temperature in PM-AC.
2. Test of PMA at the elevated temperature to give a more realistic test results which are according to realistic application, in particular for pavement conditions in Thailand
3. The specimen preparation should be compacted with large specimen. Then coring with 2 directions: vertical and horizontal direction.
4. The specimens should not be classification by density only but should be use air voids and density for classification. Typically design to have air voids in the asphaltic concrete road about 4%.