CHAPTER V

DISCUSSION AND CONCLUSION

The petrographic investigations both macroscopic and microscopic reveal that the Phu Sanao batholith is formed directly by magmatic differentiation. These rocks grade from hornblende-biotite and biotite granites to less mafic syenogranite and to alkali-feldspar granites. According to this fractional crystallization, the Phu Sanao batholith is grouped into four subunits namely, Phu Sanao,Phu Lek, Ban Kok Du and Ban Na Khaem. This batholith is also believed to emplace during early Triassic according to the cross-cutting relations with the main en echelon faulting systems. The weathering grades of the rocks in the study area are defined by visual discoloration and decomposion or disintegration features. The weathering grades in the area can be classified from grade I to VI.Weathered granites of grade V to VI distributed mostly in the lower undulating topography, especially in Ban Na Khaem subunit. The weathered rocks of grades III and IV are commonly found with corestone as continuous and discontinuous framework. Most of these grades of weathered rocks are represented by the Ban Kok Du subunit Whereas, fresh granitic rocks exposed mostly at the high mountain ridges and also some as the corestones lying within grade III and IV terrain.

The weathering features of the rockmass are intensely observed from visual characteristics. The weathering stage of the rock is then designated as numeric values ranging from 0.1 (fresh) to 1.0 (completely weathered) so that they can be mathematically compared. The physical,engineering and petrographic properties are statistical examined and certain correlation parameters are achieved.One of the most important properties in engineering works is the unconfined compressive strength. Hence, other properties are correlated to this strength property by linear regression or exponential curve fitting. The parameters that provide good correlation coefficient value are weathering decomposition (Xd), porosity (n), and point load strength index (Is 50). The empirical models of petrographic and engineering properties are proposed as the followings.

$$UCS = (5.1)(-2.49)^{Xd}$$
$$UCS = (5.19)(-0.23)^{n}$$
$$UCS = 5.8 + 19.4\ Is\ 50$$

Other factors that may affect the strength are also observed through the graphic plots. These factors are mineral compositions, grain size, grain contacts and bulk density. Certainly that the rocks at the same weathering grade, but different in the factors mentioned above would give different strength. The rock with smaller grain size, higher c-contact, lower s-contact, higher K-feldspar and lower plagioclase will establish higher strength. The influence of these factors also show through the correlation coefficient. Consequently, the curve fitted on samples in separated subunit gives higher correlation coefficient than the one fitted in combined subunits.

However, these curves still introduce similar fitting within the acceptable strength range. This will varify the validity of proposed strength model from entire granitic samples. Moreover, engineering properties of geologic materials are considered as a range of the value instead of exact one. The strength ranges of the Phu Sanao granites are 35-70, 60-260 and 120-270 MN/sq.m for the weathering grade III, II and I respectively.

Additional models for granitic rock aggregates are also obtained. These empirical models of LA abrasiveness, essential property for rock aggregates, are defined as

$$\text{LA \% of wear} = (4.4)(0.0047)^{ucs} \text{ or}$$
$$= (3.49)(0.13)^{n}$$

Final conclusion could be stated that the engineering properties of the Phu Sanao granites depend on mineral, texture and certainly the weathering grades. The rocks with high weathering grade exhibit lower strength and durability and higher abrasion lost.

Recommendations for Further Studies.

1) The strength test of the same petrographic conditions should be performed more so that influence factors are eliminated. The curve fitting should be compared between the controlled conditions samples and the combining ones.

2) Back analysis should be tried.

3) The weathering grades indcies may be designated through chemical ratio such as silica/alumina ratio. Therefore, more precise weathering gradation could be obtained. This may lead to progressive weathering study.

4) Other petrographic parameters rather than decomposition parameter should be investigated more.

5) These petrographic observation may be modified to gain proper characters for granitic rocks.