CHAPTER II

METHODOLOGY

2.1 Introduction

The purpose of this project is to study depositional environments, distribution, location and delimiting the boundary of construction sand area. In addition the construction sand would be specified according to the standard for concrete aggregate.

The planning and preparation of this study is shown in flow chart (Figure 2.1). This study was carried out in three stages: pre field work, field work and post field work.

The main objectives in preparing for the field work were study the geomorphic features and to specify the boundary of sand deposits of the survey area from the available information and from a study of the air photos.

The initial step of the survey was to collect all existing recorded information on geology and subsurface geology (well log data), natural resources, communications, climate and land use which may be pertinent to the survey area.

Field work was carried out at the selected sites for sampling at the open pits or by drilling. Furthermore

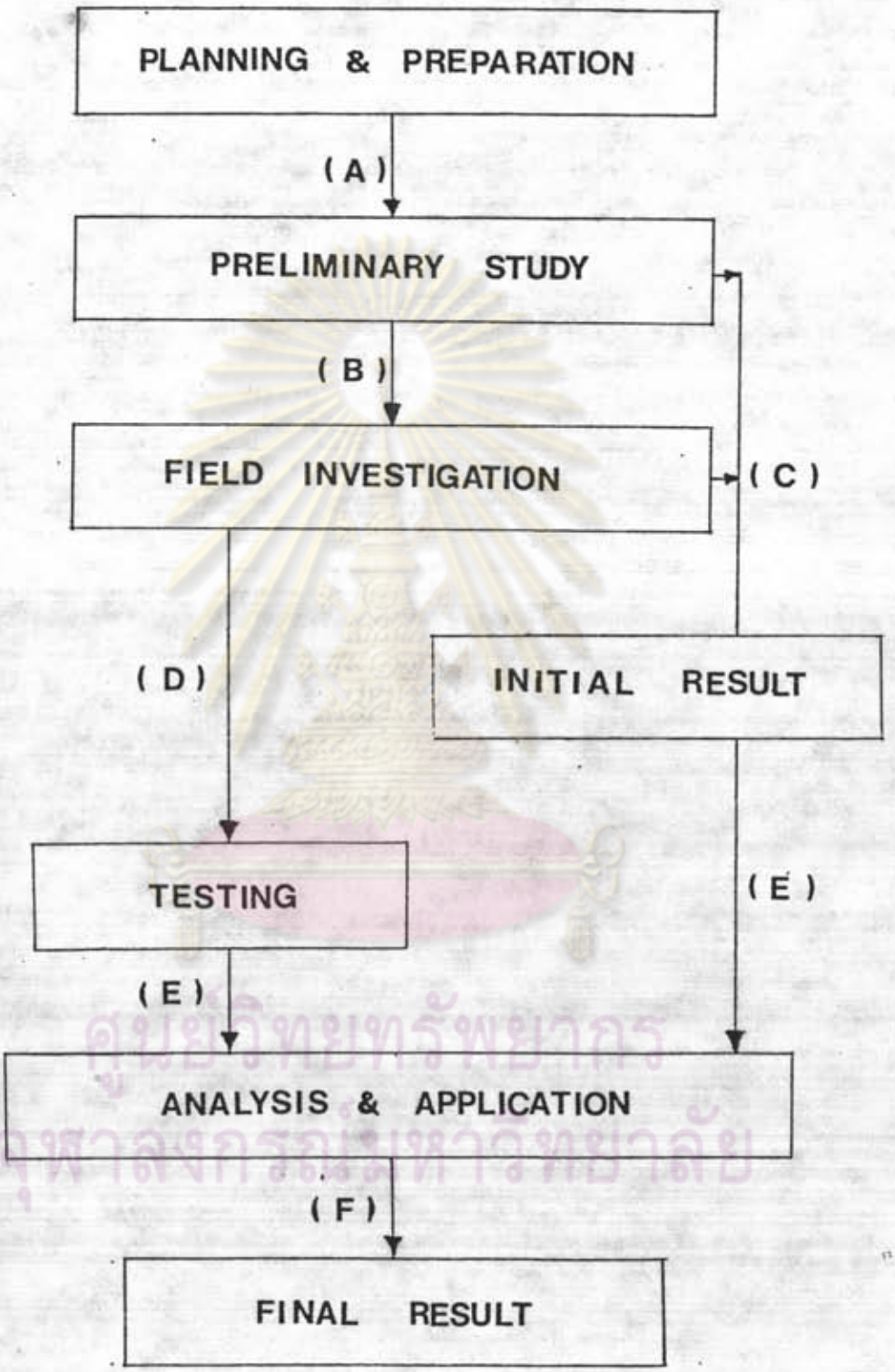

Figure 2.1 The summarized flow charts illstrating the study methodology for the study programme.

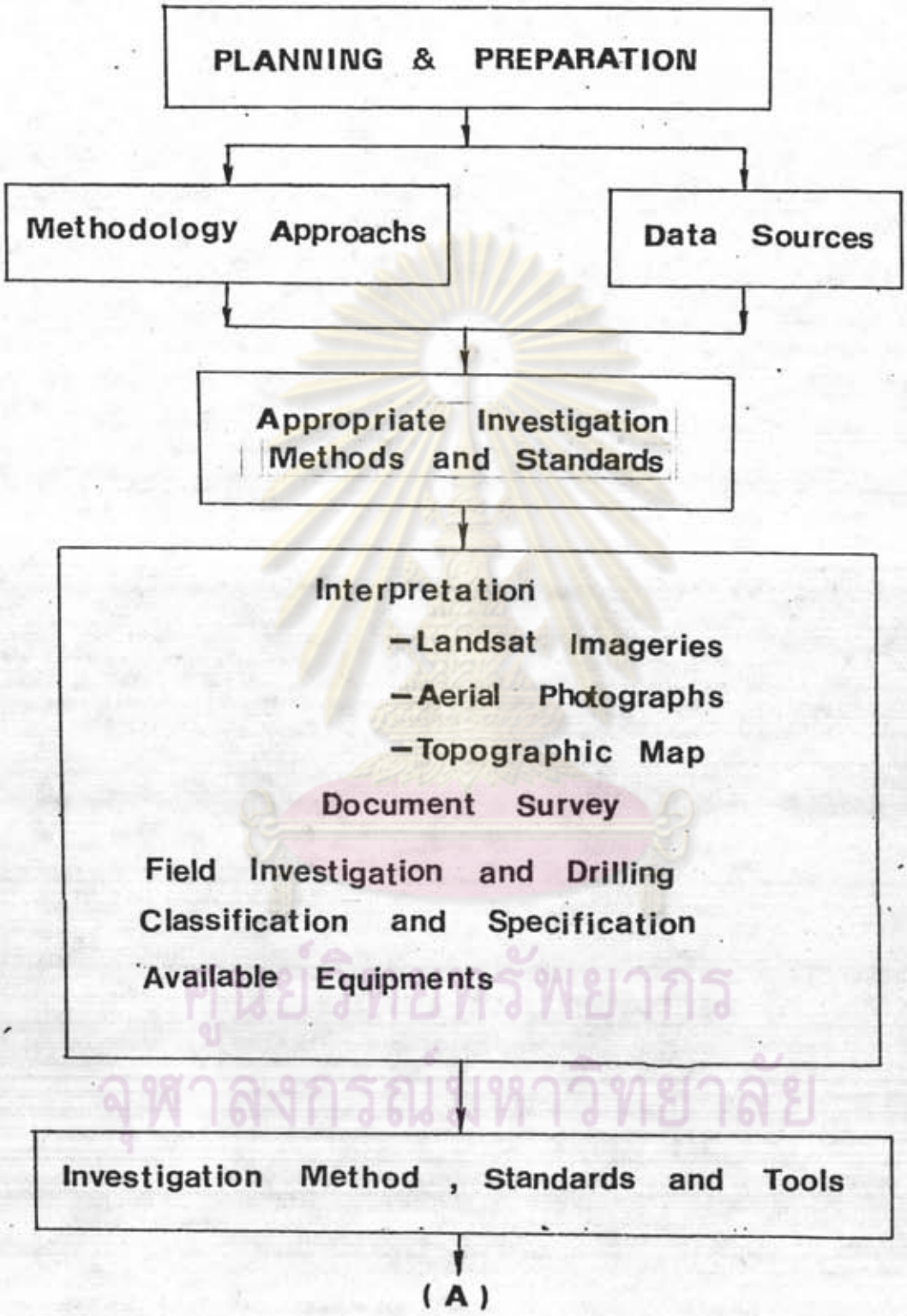

Figure 2.1 Cont.

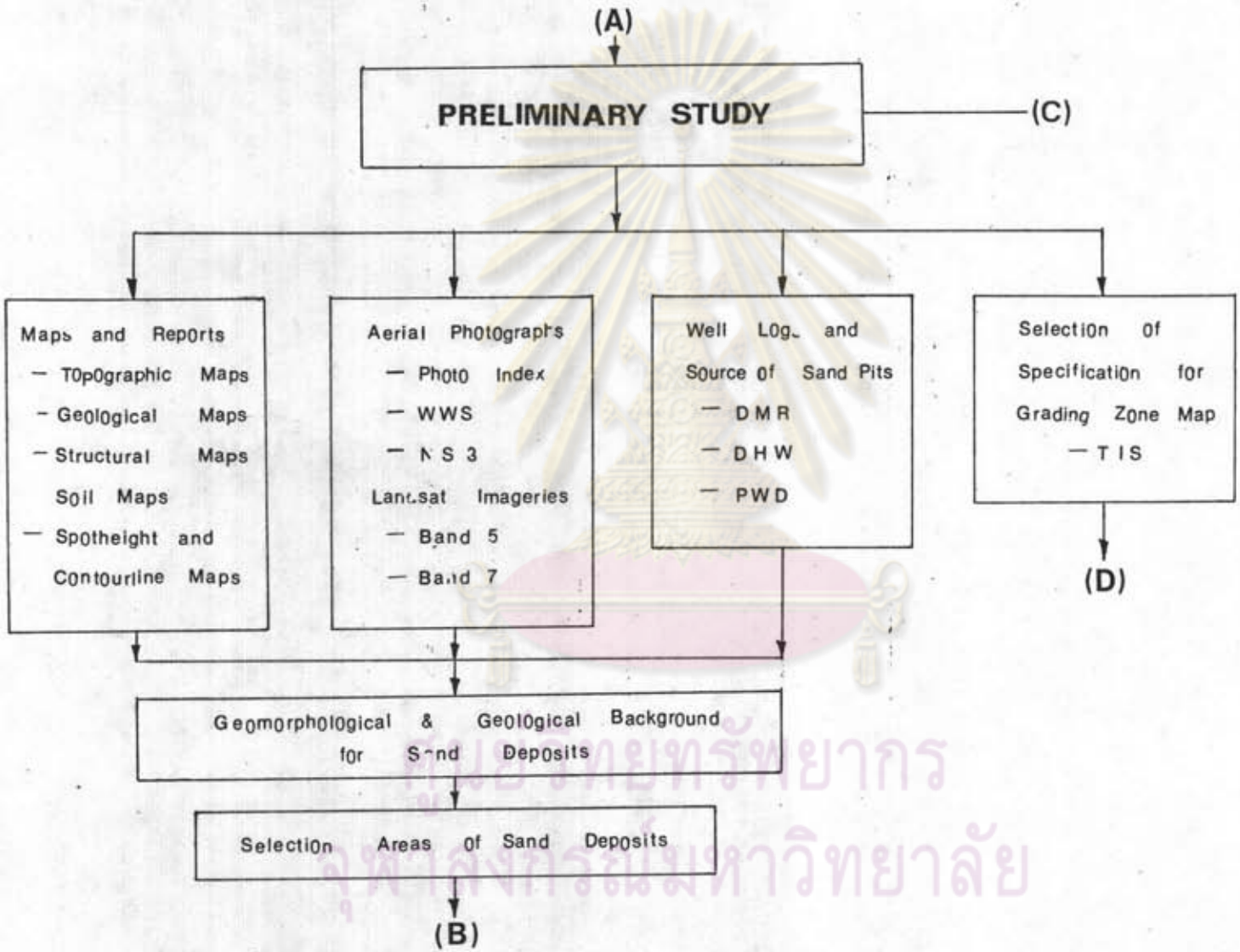

Figure 2.1 Cont.

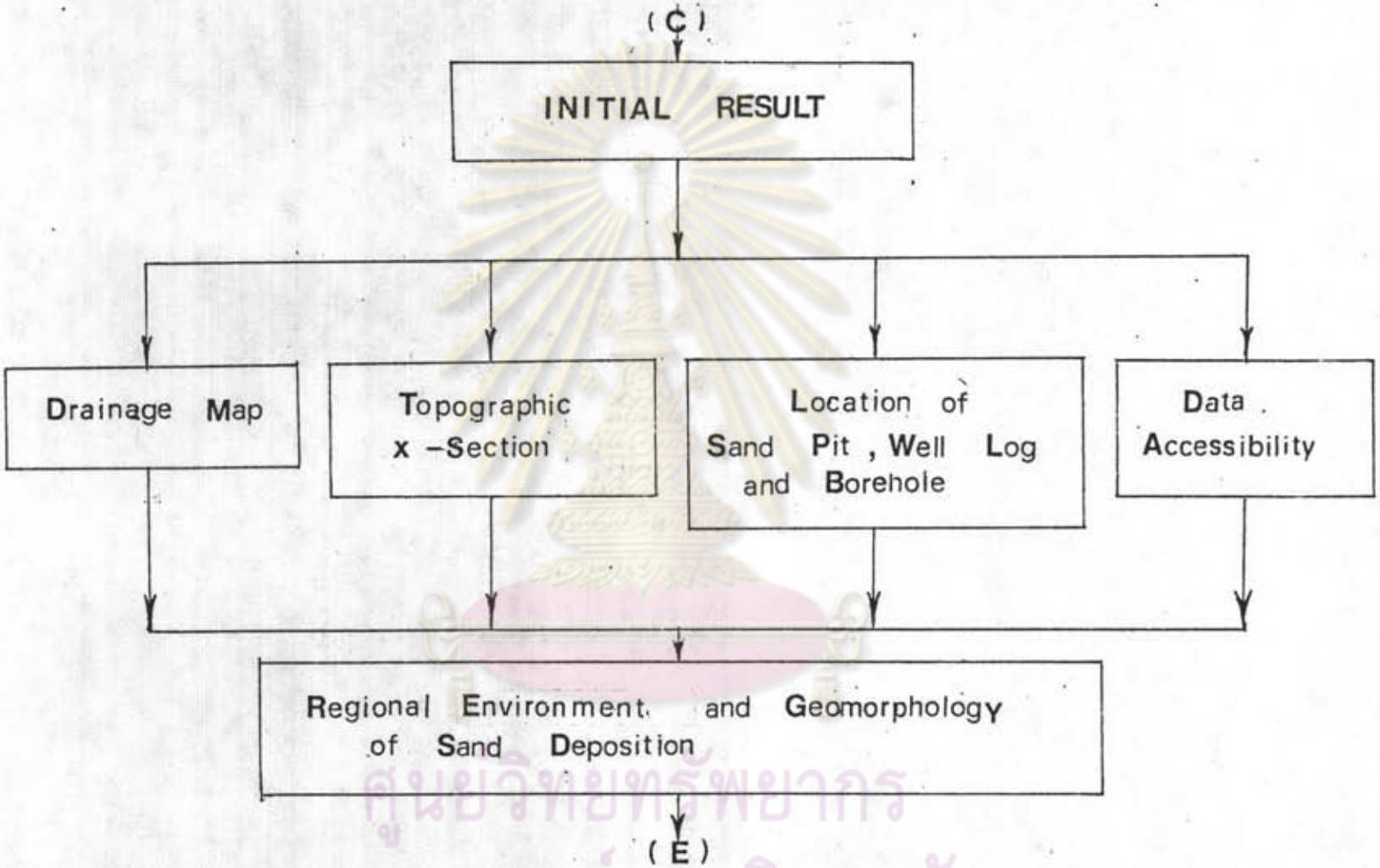

Figure 2.1 Cont.

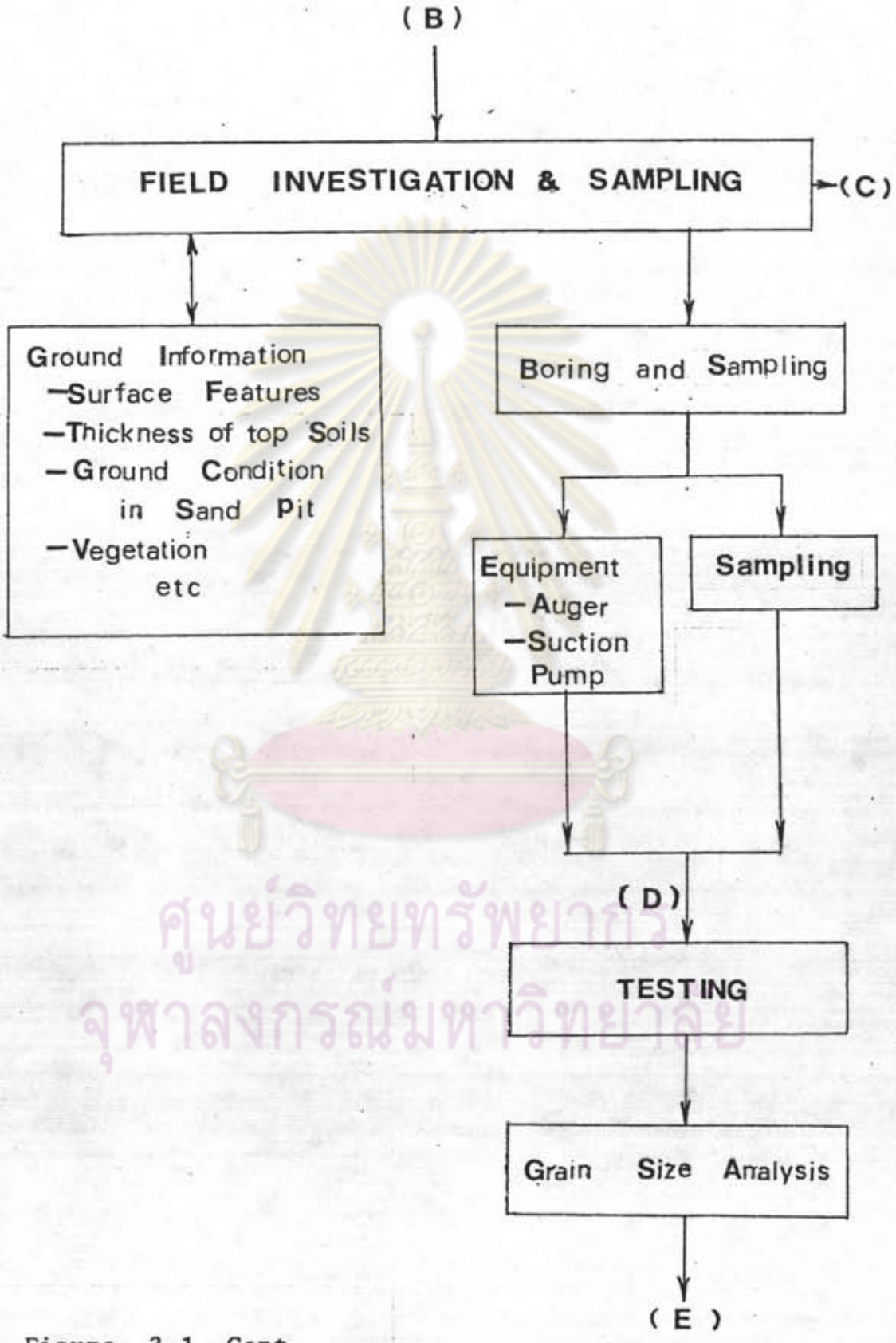

Figure 2.1 Cont.

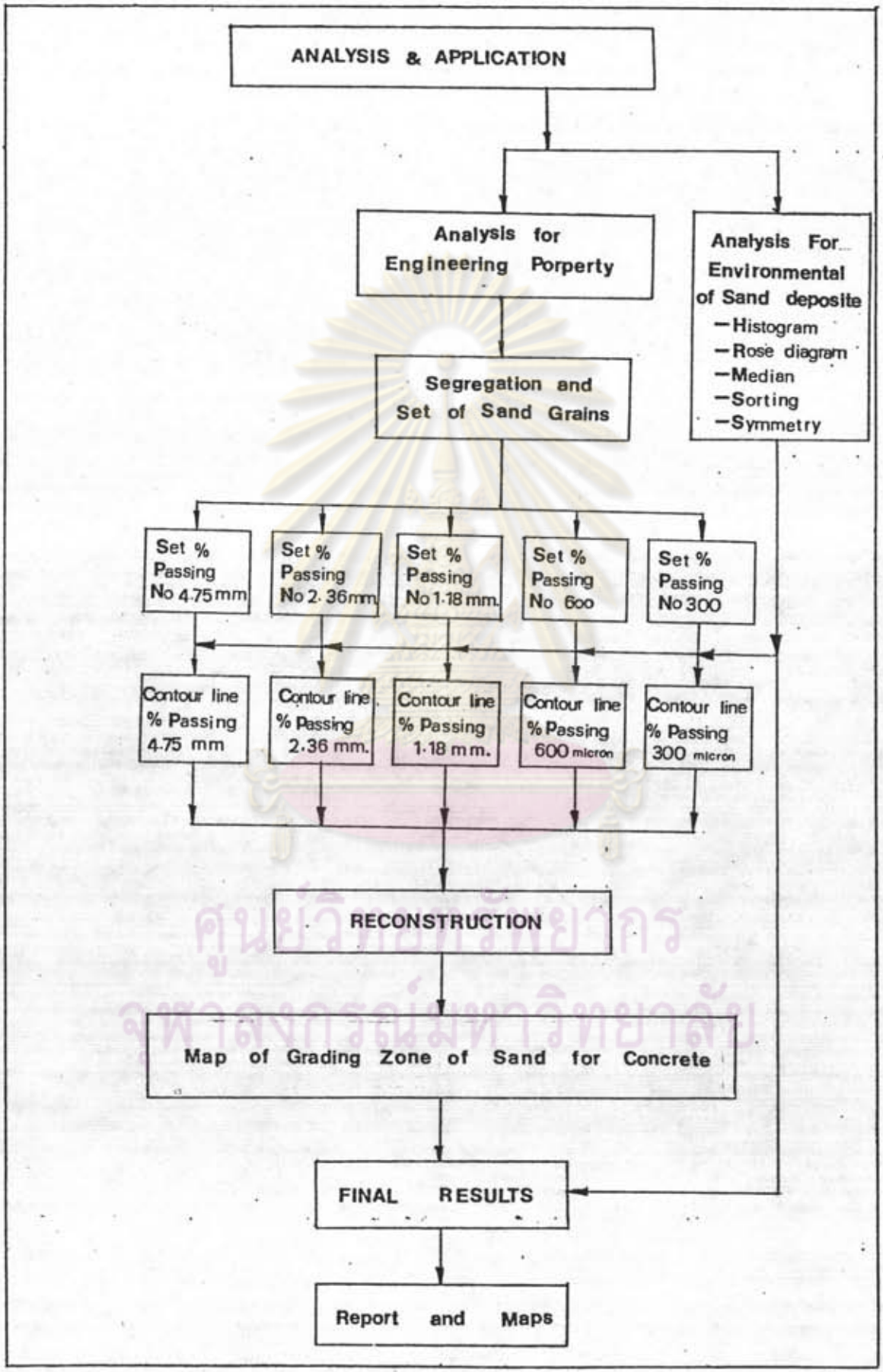

Figure 2.1 Cont.

the information on landforms, land use and other features were collected and studied. Thus initial results are obtained.

Field work and laboratory test data are analyzed and added to the initial results. These results would be able to map or to delimit Grading Zone of construction sand in the study area according to the standard for concrete aggregate.

The details of the study are as the following order.

2.2 Planning and Preparation

Investigation methods are restricted to available facilities. In this study, image interpretation through mirror stereoscope is utilized in corporating with aerial photographs together with Photo index and Landsat imageries and 1: 250,000 and 50,000 scale topographic maps and 1:100,000 scale soil maps. The elevation and ground features of the selected sites can be achieved from spotheight and contourline maps scales 1:10,000 and 4,000 of RID. Besides the studies on existing well log are added the gelogical information and planned area for drilling and checking in the field. In sampling, auger was used for soil and dry sand and suction pump for sand below ground water.

Aerial photographs and aerial photo mosaic of the study area are obtained from the Royal Thai Survey Department. These include two series of aerial photographs namely, WWS.(1954) and N.S.3(1975). The Landsat Imageries of band 5 and band 7 taken in 1980 of which the scale is 1:500,000, provide data on drainage pattern and geomorphology of the study area.

Relief, drainage patterns and transportation route networks can be readily obtained from topographic maps. The topographic maps of 1:50,000 scale are designated as work base maps to be congruent with selected aerial photographs. The topographic maps of 1:250,000 scale employed to incorporating with photo index and Landsat imageries are not only delineate primary regional geological features and soil distributions. The information obtained from this investigation were compiled and presented in a map of 1:100,000 scale. For illustrations in the report, most of the maps are reduced from 1:250,000 to approximately s 1:400,000 to fit the report format.

In 1980, the Construction Material Map scale 1:250,000 was published by the Highways Department. The map shows the location of sand pit.

The 1:10,000 and 1:4,000 scale of "Spotheight and Contourline maps" with contours interval 1 meter and 0.25 meters published by the Survey Division, Royal Irrigation Department. These maps have the important advantages for detailed study of each field investigated areas. The maps show slope, height and low landforms clearly. Moreover, they show shapes and forms of deposited sand.

2.3 Preliminary Study

In order to select representative areas for detailed investogation, existing memoirs and maps together with site investigation reports are extensively reviewed. Topographic maps, soil maps, and location of construction material maps are use in preliminary study.

From aerial photographs and spotheight and contourline maps scale 1:10,000 and 1:4,000 the sites of sand deposit were located and geomorphology of the deposits was studied. The geomorphologic features in corporating with PWD.'s well log data and the construction material map, the sites for drilling were located on mosaic map and for detailed field study.

Results of study provide geomorphological features and geological back ground of sand deposits and selected the sites for detailed field study and samping.

2.4 Field Investigation and Sampling

The objective of this stage is the detailed study at selected sites for ground information such as surface features, conjunction and ground condition at sand pit. Besides general observation of the condition of expected sand and non sand deposits in shallow level were made.

The site selected and collected samples in the same landforms are representative in that area. Thus the frequency of drilled holes per size of area depend on the repeated landforms of the study area.

In sampling, soil auger and suction pump were used (Figures 2.2 and 2.3). A sample of about 1.5-2 kilograms was collected at each site. The problem of sampling is non-cohesive sand. Mostly, sampling would get loose and caving crumble down when drilling deep to encounter sand body or subsurface water. Hand Auger was used for sampling above ground water table and suction pump for sampling below ground water table.

For suction pump, a tube containing an inner tube with a piston, consisting of a leather cup is pushed into the ground by pulling and releasing the inner tube a "sucking" effect is produced. A continuous, but slightly disturbed sample is obtained

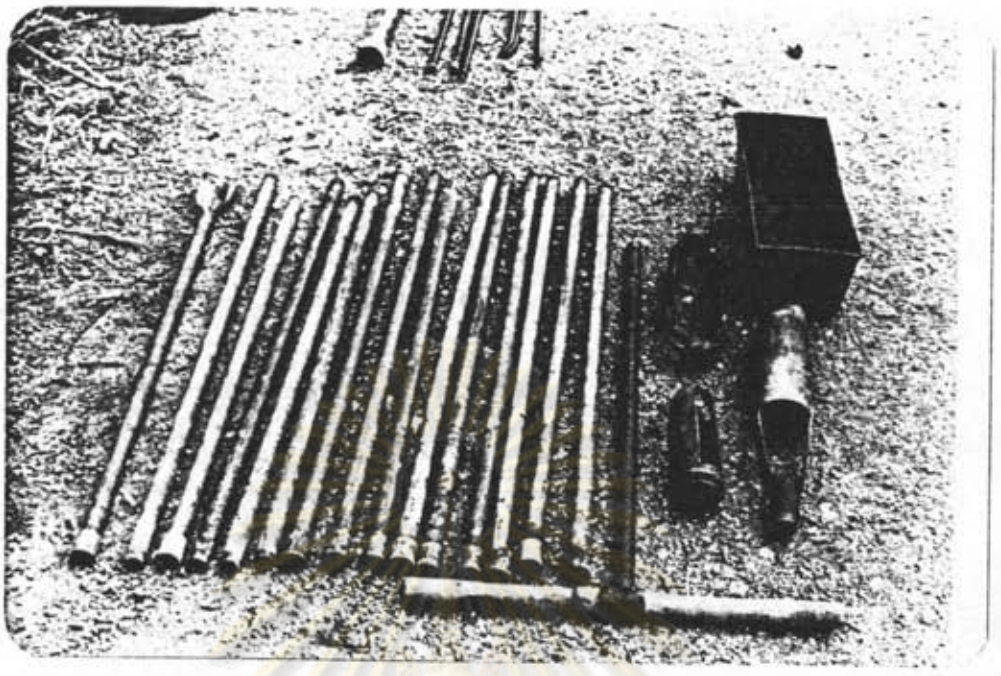

Figure 2.2 Show hand auger for drilling above ground water table.

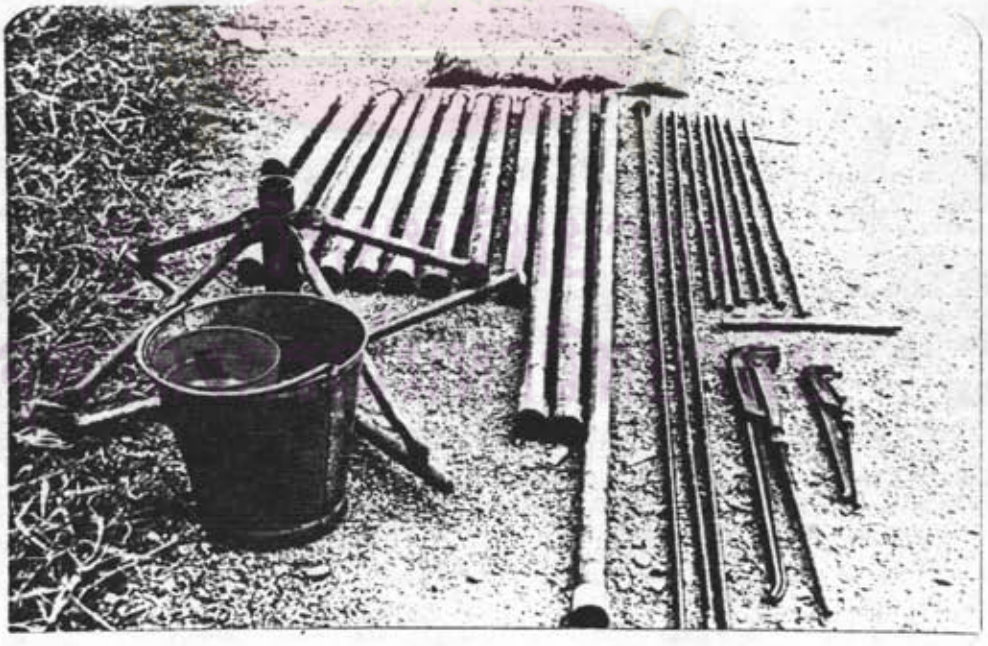

Figure 2.3 Shaw sand pump for drilling below ground water

The collected sample may have some problems. The samples will be mixed with silt or clay from top soil and from broken caving when drilling down to deep level. Therefore the samples would collected from 2 to 3 meters below the top of the sand layer or 4-5 meters from ground surface.

The field investigation was to determine the different of topographic features and landfrom between area of sand deposits and area of nonsand deposit. The data on slope, vegetation and land use are also collected.

The field investigation data are the initial results of the study. The samples collected and field information were to be studied and analyzed in the next stage.

2.5 Grain Size Analysis and Testing

In this stage samples were analyzed for grain size distribution in order to classify the sand according to specification for concrete aggregate.

Grain size analysis consists of three general procedures of analysis. They are sieve, hydrometer and combined analysis. If nearly all its grains are so large that they cannot pass through square opening of 0.74 mm.(No.200 screen), the hydrometer test is recommended. For silts, silty clays, etc. which have a measurable portion of their grains both coarser and finer than a

No.200 sieve, the combined analysis is needed.

Samples are fine aggregate thus sieve analysis is employed. A sieve analysis consists of shaking the soil through a stack of wire screens with openings of known sizes, the definition of particle diameter for a sieve test is; therefore, the size dimension of a square hole (Lambe, 1951).

Sample of sand are separated into grain sizes by sieving. Each separated into grain sizes range is weighted expressed as a porportion, by weighted, of the whole sample. The results are plotted on a specially prepared form related to the sieve sizes use to give a particle size analysis graph. The technique is established and presented. The details are shown on Appendix A.

The results from testing is weight of soil retained in each sieve. In sieve size 25.4, 19.10, 12.70, 9.52, 4.75, 2.00, 0.42, 0.149 and 0.074 mm. of U.s. Bureau of Standards.

1. Percentage retained on any sieve = $\frac{\text{Wt. of soil retain} * 100}{\text{total soil wt.}}$

2. Cumulative percentage retained on any sieve = Sum of percentages retained on all coarse sieves

3. Percentage finer than and sieve size = 100% - Cumulative percentage retained.

Representation of size frequency distribution arranged according to size, the detrital elements in a mechanically deposited sand grain would be found to differ in size from one another by infinitesmals. The size frequency distribution is said to be continuous. It is convenient to subdivide this continuous distribution into a series of classes or grades.

The usual graphical representations are a species the histrogram and the cumulative curve. The histrogram and cumulative curve are wellknown devices for presenting frequency distribution of and kind. As used for size analyses, they commonly show the percent in each class base on weight of the material in that class rather than the number or a percentage base on count. Moreover, the size values plotted on the X-axis are in fact the logarithms of the diameter rather than the size themselves. The widths of the bars of the histogram, for sample, are equal even though the classes represented are not. Similarly the size scale (X-scale) of the cumulative frequency curves is in fact a logarithmic scale. Many cumulative curves on this plot appear as a S-shaped curved of the ordinary plot. They fine Q1 - first quartite or 75% percentite of the cumulatuve curve , Md - median or 50%

percentite, Q3 - third quartite or 25% percentite, So- sorting, and Sk- skewness .

The study in graphic parameters of size frequency distribution, Pettijohn (1975) study size composition of clastic sediment represented by cumulative curve in semilogarithmic paper. The fundamental attributes, then are

1. average size or central tendency

Md = Median

2. Sorting or dispersion

$So = \sqrt{Q3/Q1}$ (coefficient of sorting)

3. Symmetry or skewness

$Sk = Q3 * Q1/Md_2$

(coefficcient of skewness)

Usage formula of Pettijohn(1975) because grain size of material have sand size and caculation of percentage by weight passing in engineering porperty used semilogarithmic paper which study to relation of grain size distribution and engineering porperty.

Standard procedure uses the percent passing (also termed percent finer) as the ordinate plotted to a natural scale of the grain-size distribution curve. The grain size curve plotted with increasing grain size from left to right. This curve would be study percent passing in sand size 4.75 mm., 2.36 mm., 1.18 mm., 600 microns, and 300 microns. These sand size are size of fine aggregate in Standard for Concrete of Aggregates of Thai Industrial Satandard Institute (TIS 566-2528). The percent passing in each sizes of each samples, it divided in the term percentage contourline, which it can study grain size distribution in each sizes.