

MARQUETTE UNIVERSITY
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

LAB REPORT FORMAT

- a. All reports must be typed and include the following sections in the order specified:

Title Page
Introduction
Summary of Tests
Summary of Results
Discussion Items
Recommendations
Appropriate Data Tables (May be included within text)
Appropriate Figures (May be included within text)

You should use a word processor to prepare your report and be sure to conduct a spell check prior to submission.

- b. An example lab report is attached which illustrates how the above sections could be included in your report. This example is provided for illustrative purposes and is not intended to completely satisfy all necessary inclusions for every lab report. Lab reports do not have a specified length; they should be concise and provide the reader with a complete knowledge of what was done, what information was obtained, and how the information relates to recommendations provided..
- c. Lab reports should generally be written in the third person. You should avoid statements such as "I conducted the following tests ...," instead using phrases such as "The following tests were conducted ..."
- d. All tables included in the report should be assigned a number, title and appropriate column and/or row headings as appropriate. Remember that each data table should stand alone in presenting results. Thus, any qualifying information that is required to clarify column/row headings should be provided as notes to the table.
- e. All figures included in the report should be neatly prepared, assigned a figure number, and referenced somewhere in the report. When preparing figures, be sure to use the proper axis type(s) (i.e., arithmetic or log) and to label axes properly, including an axis label and clear scaling. When using arithmetic scales, be consistent in your scaling (i.e., 1 tick = 1 psi, etc.). Never explode scaling as you move along a scale to allow for the inclusion of all data in a shorter space. Many times the shape of curves fit through data points will make no sense if the scales are improperly distorted.

CEEN 162 - Geotechnical Engineering

Lab Report 1
Borrow Soil Assessment

prepared by

Student Name
Laboratory Session
Submission Date

INTRODUCTION

This report presents the analysis results of a proposed borrow soil intended for use in fill areas of an upcoming highway construction project. The conclusions and recommendations provided herein are based on the results of laboratory tests conducted on representative soil samples obtained from the proposed borrow location.

SUMMARY OF TESTS CONDUCTED

Soil tests were conducted on an a representative sample of soil provided in the air-dried state. Soils test included a dry sieve analysis, a hydrometer analysis, specific gravity of solids, liquid limit and plastic limit. All tests were conducted in the soils laboratory at Marquette University generally following the procedures specified by the American Society of Testing and Materials (ASTM).

SUMMARY OF TEST RESULTS

A summary of the grain size distribution of the soil is provided in **Table 1 and Figure 1**. The data provided in **Table 1** was obtained using the combined results of the dry sieve and the hydrometer analyses. **Table 2** provides pertinent soil data necessary for soil classifications, including gradation parameters, specific gravity of soil solids, and Atterberg limits.

Table 1 - Grain Size Distribution of Soil

U.S. Standard Sieve Number	Grain Size (mm)	Percent Passing (by weight)
No. 4	4.75	100
No. 8	2.36	92
No. 10	2.00	82
No. 40	0.425	65
No. 100	0.150	62
No. 200	0.075	54
	0.050	48
	0.002	12

Figure 1 - Grain Size Distribution

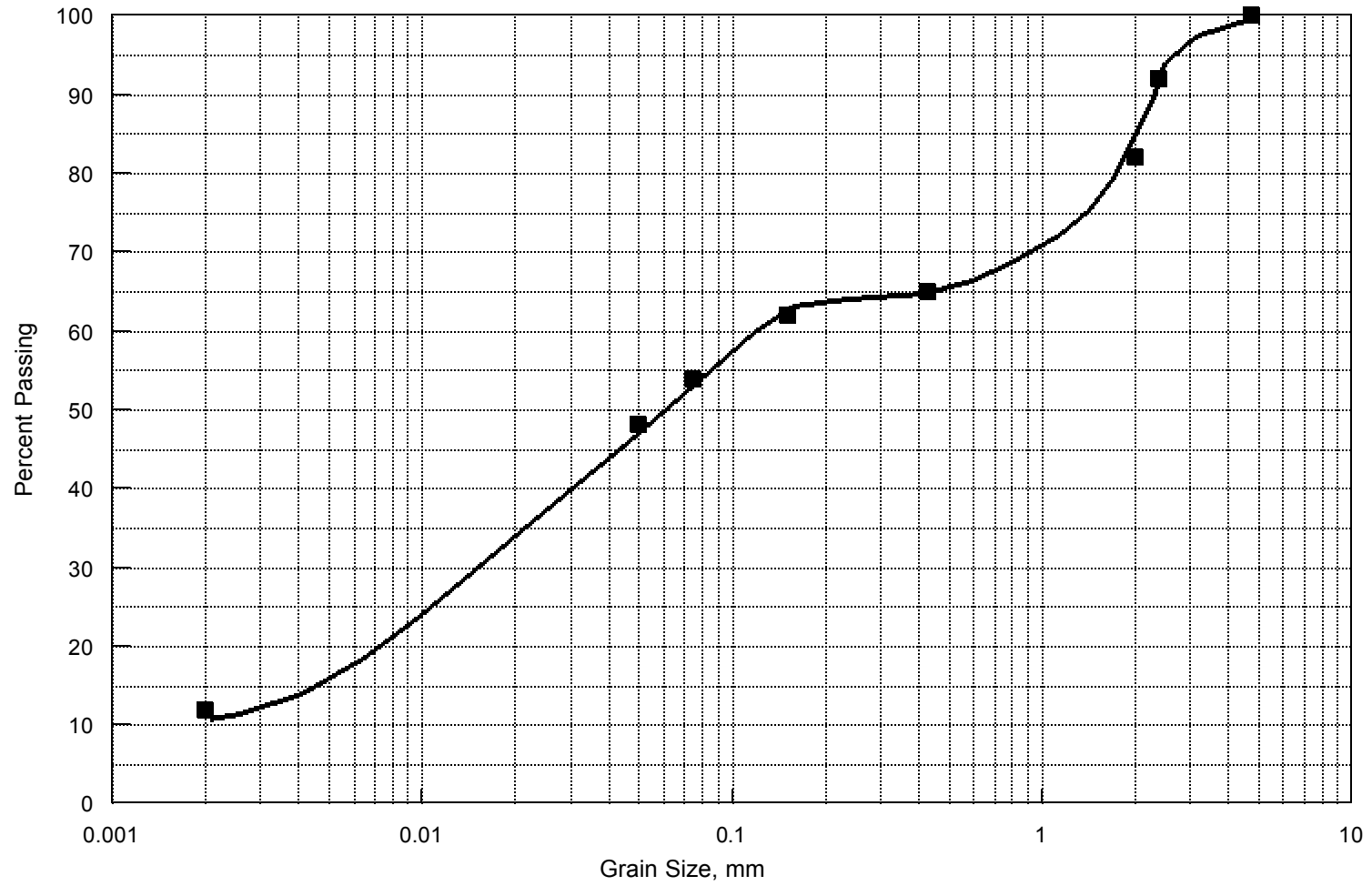


Table 2 - Soil Data

Effective Size, D_{10}	0.001 mm ⁽¹⁾
D_{30}	0.035 mm
D_{60}	0.145 mm
Uniformity Coefficient, C_U	145
Coefficient of Gradation, C_Z	8.45
Specific Gravity of Soil Solids	2.68
Liquid Limit	39
Plastic Limit	24
Plasticity Index	15

⁽¹⁾ Estimated based on extrapolation of gradation data

SOIL CLASSIFICATION

The soil classifications, based on the data provided in **Tables 1 & 2** and procedures outlined under both the Unified Soil Classification System (USCS) and the American Association of State Highway Transportation Officials (AASHTO) system, are as follows:

USCS : CL, Sandy Lean Clay

AASHTO: A-6 (5) Clayey Soil

Soils of this type are also commonly described as inorganic clays of low to medium plasticity.

SUITABILITY

Soils of the type contained in this borrow location are generally rated as fair to poor subgrade materials with medium to high potential for frost action and medium potential for compressibility and expansion. When compacted these soils are practically impervious to water flow by drainage.

DESIGN STRENGTH VALUES

Typical design strength values for soils of this type are as follows:

CBR value: 15 or less

Subgrade Modulus: 50 - 150 psi/in

Design strength values are a function of soil type, compacted density and moisture content.

COMPACTION REQUIREMENTS

Clayey soils of this type are best compacted with sheepsfoot rollers in combination with rubber-tired rollers. Compacted dry unit weights ranging from 90 to 130 lb/ft³ are typical. The optimum moisture content for compaction is estimated at approximately 24%, which is equal to the measured Plastic Limit of the soil. Specific values of maximum dry unit weight and optimum moisture for this soil should be determined from laboratory Proctor analysis, if required.

RECOMMENDATIONS

Based on the information presented herein, it is recommended that this borrow location be excluded from consideration for use as a subgrade fill material unless adequate provisions can be made to reduce the likelihood of frost penetration and adequate drainage, in the form of longitudinal ditches or their equivalent, be provided to minimize moisture infiltration into this soil. Consideration may also be given to stabilization of the soil, using lime or fly ash, to improve the soil strength and stability. The specific type of stabilizers and treatment rate should be developed based on a laboratory analysis of soil/stabilizer combinations.