developed pressure for unconfined soil. In confined tests, net developed pressure determined by deducting full value of static head at a volume weight of 125 pounds per cubic foot. Soils in Table I classified according to U.S. Bureau of Public Roads grouping.

(2) Load Tests or Piles.
  (a) Springwells Filtration Plant.
  (b) Delray Power House.
  (c) Fort Street Grade Separation.
(3) Damages due to Tunnel Construction.
(4) Bearing Value of Granular Material.
  (a) St. Felix Villa, Detroit, Michigan.
  (b) Carillon Tower, Ann Arbor, Michigan.
(5) Load Tests on Hardpan for Caisson Construction, City National Bank, Lansing, Mich.
(6) Practical Application of Penetration Method Used on Four Major Structures in Detroit Area.

g. Other Investigations.
(1) Earth Pressure on Underground Structures. Results from installation of 138 Goldbeck pressure cells on tunnels, etc. over 3-year period available for publication within year.
(2) Damage due to Tunnel Construction and other Excavation. Not yet available for publication in detail, general information available within a year.
(3) Stability of Granular Materials. Laboratory Investigation. Preliminary results published by D. S. Berry, Proceedings A.S.T.M. Vol. 35, Part 2.

8. Observations on Existing Structures.
Structures noted in Table I all under observation.
Settlements taken at approximately six-month periods.
Observation points, from three on an individual pier footing at each end and center to several hundred on large structures.
Approximately 10 major structures under observation.
Bridges, power plants, industrial buildings.

9. Experience with Observed Structures.
See references given in connection with bearing value of soils.

No. A-7 CORNELL UNIVERSITY SOIL MECHANICS LABORATORY

H. T. Jenkins, Assistant Professor of Civil Engineering in Cornell University at Ithaca, N. Y.

The Soil Mechanics Laboratory at Cornell was established in November, 1935, by the School of Civil Engineering. Primarily it is used in conjunction with the Soil Physics and Soil Mechanics Courses which are offered in the School, and for graduate research. It is also used for the laboratory work in soils for subgrades required by the Highway courses.

The laboratory is 16 feet by 28 feet in size and provision has already been made for doubling this area. The humid room and freezing room are adjoining. The capacity of the latter room is 125 cubic feet, with a temperature range of + 70°F to - 17°F. It is equipped with modern refrigerating machinery, thermostatic control, and automatic recording of temperature, and will be used for the investigation of frost action on soils as well as for the tests now in progress.

Sufficient equipment for making routine tests is available to eight men at a time, and the laboratory sections are limited to that number. Thus, the determination of specific gravity, moisture content, void ratio, moisture equivalent, mechanical analysis, and Atterberg limit tests are made by each student. The larger experiments on the physical and mechanical properties of soil, such as tests for shearing strength, compressibility, and permeability are performed by the class as a whole. All such work is coordinated with lectures given in the Soil Mechanics course.

Two analytical balances, a thermostatically controlled electric drying oven, centrifuge, and constant temperature bath are among the larger pieces of equipment. Outlets for water, gas, compressed air and electricity (both A.C. and D.C.) are spaced at the laboratory tables, and four especially-trapped sinks are installed. Ample cupboard, shelf, and drawer space is provided for supplies, field tools, miscellaneous equipment, and soil samples. A small storage room is also available.

Under a coordinated investigation of various dam sites and borrow-pits, samples brought into the laboratory from all over New York State are tested. A quantity sufficient for permeability, compression, and shear tests is stored in large cans and undisturbed samples are placed in sealed quart Mason jars for the determination of apparent specific gravity and moisture content. A complete description of conditions at the site accompanies each sample. The results of the various tests are used as a basis for the design of earth dams impounding water at locations owned by the state for conservation and recreational purposes.

During the construction of earth dams at these sites it is intended that apparatus for measuring the settlement of foundations will be installed, as well as some means of recording pressures and rates of percolation within the dam itself. From such investigations under the control of the staff, it is

hoped that much useful data will be obtained for correlation with work done on soils in the laboratory.

Tests on the flow of water under dams have been conducted at Cornell, using an electrical analogy for determining the flow net in connection with various shaped cores and downstream faces. This work is to be carried on and amplified as graduate research, and the results published later.

Admixtures of various salts and subgrade soils are being subjected to careful routine tests and changes in the standard subgrade soil constants noted for each change in percentage of salt. This project will probably be completed early in the summer.

The apparatus for consolidation and permeability of soil has been completed recently, and a series of tests is under way at the present time. A duplication of test cylinders is contemplated, in order to facilitate the making of a large number of tests, and the school mechanician is expected to do this shortly.

Ithaca is located in the Finger Lakes Region of New York State, where the underground is composed of glacial till and unstratified glacial clay of the Pleistocene epoch. Sufficiently comprehensive tests have not been run by this laboratory, but in general the clay samples are well graded, true specific gravity approximately 2.72, water content 35% - 45%, shrinkage limit 15% - 20%, centrifuge moisture equivalent about 25%, and low plasticity indices.

The laboratory and research projects are in charge of Assistant Professor Herbert T. Jenkins.

No. A-8

REPORT OF SOILS TESTING LABORATORY FORT PECK DISTRICT, U. S. ENGINEER OFFICE FORT PECK, MONTANA

J.P. Hartman, Assistant Engineer

Introduction. The purpose of this paper is to discuss several types of tests being made in the Fort Peck District Laboratory, together with the equipment and technique used, in an effort to provoke constructive comments. Some of the methods and apparatus are believed to be novel in design and adaptability, while some other standard types have been improved. No attempt has been made to outline the operation of all the tests, because the procedures are more or less standard. For details of all types of tests, the reader is referred to the main paper submitted under this title.

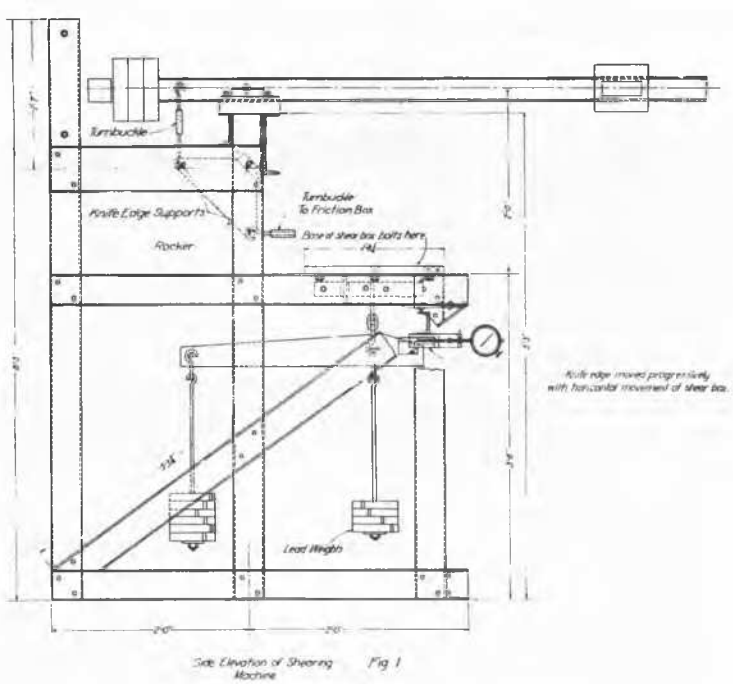
Synopsis. 1. The beam type shearing machine originally designed at M. I. T. has been improved by changing the fixed fulcrum of the vertical load lever arm to a sliding fulcrum, adjustable horizontally as the shear test progresses. This modification has given much more reliable results.

2. A shear machine and consolidation machine as originally designed in the Soils Laboratory of the U. S. Engineer Office, Zanesville, Ohio, are described together with the method of operation.

3. An inexpensive apparatus has been developed for consolidation, permeability under vertical load, and expansion pressure tests, which gives very satisfactory results.

4. A method is outlined for determining shearing stresses induced in the foundation under an earth fill by means of gelatin models and polarized light equipment. The manner of reproducing the prototypes is believed to be novel.

5. A comparatively inexpensive and simple method for taking undisturbed samples from foundations to depths of 120 feet is discussed.



Side Elevation of Shearing Machine Fig. 1

The Shear Test. The M. I. T. design--the original shear machine as designed at the Massachusetts Institute of Technology (1) (Figures in parenthesis refer to Bibliography) and later improved at Harvard University (2) has one feature that noticeably affects the accuracy of shear tests on undisturbed clay samples. The fulcrum point of the lever arm used in applying the vertical loads to the soil sample is fixed, which forces the vertical loading rods to rotate about the center knife edge on the lever arm as the upper section of the shear box is pulled horizontally. As movement progresses, this causes the upper section of the shear box to rotate, thus effecting the distribution of vertical pressure over the cross section of the sample. Also a horizontal component of the vertical load is created, acting opposite to the shearing load. The combination of these two effects results in an appreciable error in the test data.

The M. I. T. machine has been improved by rearranging the fulcrum so that it will slide horizontally in a guide. The fulcrum can be moved simultaneously with the movement of the shear box by turning a screw, thus keeping the