

## NEW DEMANDS OF ENGINEERING ON GEOLOGY IN ILLINOIS\*

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The modern trend of specialization forces engineers to devote so much attention to their special technique that in order to obtain information about certain aspects of their problems they must turn to technicians equally specialized in those fields. The engineers in Illinois have not lagged in this respect and not least among the professions from which they have sought technical information is geology. In recognition of demands for geological advice which come from all branches of engineering, the State Geological Survey nearly three years ago organized a section of engineering geology in which special attention is given to engineering problems. The highway engineers have been especially anxious for information, and their needs have been emphasized by the tremendous program of highway construction which has been followed for the last fifteen years.

Many of the problems that have been presented concern various types of landslides, which cover, move away from, or move a pavement or railway out of alignment. These problems generally involve a study of stratigraphic conditions as related to drainage, and many of them are solved by adequate drains at critical places. Rock-falls, like the one at Savanna which was described before the Academy last year, are a type of landslide.

Peat bogs also present numerous problems in which it is necessary to ascertain the depth and character of peat. If the peat be shallow it may be excavated and replaced by solid material for a highway or railway fill; if it be deep, the fill may be built across it and explosives used to assure a satisfactory settlement. Drainage of peat bogs is also a relevant question of which the solution depends on geologic knowledge. Peat terraces along old valleys are similar to peat bogs, but they are sufficiently different that they require different treatment. Studies of several peat bogs have been made to ascertain the possibilities of their adaptation for parks and playgrounds.

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Heave and disruption of concrete slabs and other structures because drainage is poor is a common problem wherein geologic knowledge can help in providing a remedy. Frequently highway engineers now call for advice in draining wet spots before pavement is laid, so that adequate drainage can be installed as a preventive measure. The drainage to prevent landslides and to clear bogs has been mentioned. It is not infrequently necessary to ascertain if the construction of highways or other structure will interfere with the water supply of a private concern, a park, or a municipality. Sometimes it is necessary to determine whether or not a stream has been diverted, and if so, by what agency. The question of sewage disposal frequently involves a question of drainage, especially where sinkholes and underground channels are encountered.

The determination of the bedrock and the unconsolidated deposits at a bridge site or along the approaches to a bridge is very important, not only because much depends on adequate foundations for such structures but also because the condition may determine the type of structure. The geologic conditions at a proposed or excavated subway at intersections of transport routes have important bearing on the cost and safety of the structure and may determine the choice between a subway and an elevated overpass.

In several cases a geologic examination has enabled engineers to estimate amounts of different classifications of materials to be excavated, and this has an important economic bearing on cost of construction. Satisfactory material for large grade-fills can be selected with geologic assistance. There are abundant cases where geologic knowledge assists in selecting satisfactory material—be it sand, gravel, or limestone—for aggregate in concrete structures, for road metal, for ballast, etc. In some cases the character of material in an operating or in a proposed pit or quarry is determined by geologic evidence. Numerous pits, quarries, and deposits have been visited for this purpose. At the present time a careful reconnaissance of the state is being made to locate and determine the character of material in every deposit that offers any hope of being a source of materials for the improvement of secondary roads.

Routes of proposed highways have been modified to suit geologic situations. Peat bogs, landslides, and steep slopes are avoided as much as possible. Sites for reservoirs for municipal water supplies are selected according to geologic situations, and the dams for the reservoirs are constructed to suit geologic conditions. Studies have been made at localities where coal has been or is being mined, to determine if there may be surface subsidence sufficiently serious to endanger large buildings in the vicinity.

In all of these types of engineering problems, the knowledge of the geology of the state as available at the State Geological Survey has been applied to assist the engineers. Specific examples where each type of problem has been attacked are so numerous that they can not be listed. Nearly every problem has so many interesting features that a discussion of it would be a fitting topic for a scientific paper. A general survey of the field is all that can be presented here.

The topographic maps which are prepared in cooperation by the U. S. Geological Survey and the Illinois State Geological Survey are in themselves a source of information and benefit to all types of engineers. The uses to which they have been put by engineers comprise a long list and constitute material for a lengthy discussion which can not be presented here. It is regretted that lack of time prevents the presentation of detailed accounts of the results of recent studies in the field of engineering geology as it is being developed in the state.