

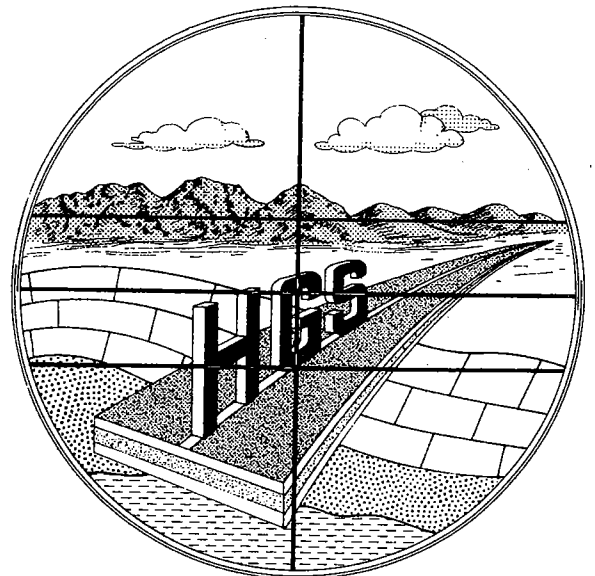
SPECIAL PUBLICATION 22

PROCEEDINGS of the 33rd ANNUAL HIGHWAY GEOLOGY SYMPOSIUM

ENGINEERING GEOLOGY and ENVIRONMENTAL CONSTRAINTS

IN
VAIL, COLORADO
1982

JEFFREY L. HYNES, EDITOR



Colorado Geological Survey
Department of Natural Resources
Denver, Colorado

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Denver, Colorado

1983

\$9.00

33rd ANNUAL HIGHWAY GEOLOGY SYMPOSIUM
SEPTEMBER 15-17, 1982
VAIL, COLORADO

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The sponsorship of the 33rd Annual Highway Geology Symposium was unusual in that no single organization undertook complete sponsorship of the meeting. The above named individuals undertook the organization informally. Special thanks are due to their employers for making available the time and support services required.

BANQUET SPEAKER

Alan F. Huggins
District Vice President
International Engineering Company
"The Road We Couldn't Build"

HIGHWAY GEOLOGY SYMPOSIUM:
Its History, Organization, and Function

Born of the need to establish a better understanding and closer cooperation between geologists and civil engineers in the highway industry, the Highway Geology Symposium was organized and held its first meeting on February 16, 1950 in Richmond, Virginia. Since then, 31 consecutive annual meetings have been held in 22 different states. Between 1950 and 1962 the meetings were held east of the Mississippi River, with Virginia, Ohio, West Virginia, Maryland, North Carolina, Pennsylvania, Georgia, Florida, and Tennessee serving as the host states.

In 1962, the Symposium moved west for the first time to Phoenix, Arizona. Since then, it has rotated, for the most part, back and forth from east to west. Following meetings in Texas and Missouri in 1963 and 1964, the Symposium moved to Lexington, Kentucky in 1965, Ames, Iowa in 1966, Lafayette, Indiana in 1967, back to West Virginia at Morgantown in 1968, and then to Urbana, Illinois in 1969. Lawrence, Kansas was the site of the 1970 meeting, Norman, Oklahoma in 1971, and Old Point Comfort, Virginia the site in 1972.

The Wyoming Highway Department hosted the 1973 meeting in Sheridan. From there it moved to Raleigh, North Carolina in 1974, back to the west to Coeur d'Alene, Idaho in 1975, Orlando, Florida in 1976, Rapid City, South Dakota in 1977, and then back to Maryland in 1978--this time at Annapolis. Portland, Oregon was the site of the 1979 meeting, Austin, Texas in 1980, and Gatlinburg, Tennessee in 1981. The 1982 meeting was held in Vail, Colorado in September. Meetings in 1983 and 1984 are planned for Georgia and California.

Unlike most groups and organizations that meet on a regular basis, the Highway Geology Symposium has no central headquarters, no annual dues, and no formal membership requirements. The governing body of the Symposium is a steering committee made up of about 20 engineering geologists and geotechnical engineers from state and federal agencies, colleges and universities, as well as private service companies and consulting firms throughout the country. Steering committee members are elected for three-year terms, with their elections and re-elections being determined principally by their interests and participation in and contributions to the symposium. The officers include a chairman, vice chairman, secretary, and treasurer, all of whom are elected for a two-year term. They may succeed themselves for one additional term.

A number of three-member standing committees handle the internal and external affairs of the organization. Some of these are: the By-Laws Committee, Public Relations Committee, Award Selection Committee, Publications Committee, etc. Committees are held to a minimum for the most part, however, to avoid bureaucratization of the organization. The lack of rigid specialization, requirements, and routine and the relatively relaxed overall functioning of the organization is what attracts many of the participants.

Meeting sites are chosen two to four years in advance and are selected by the Steering Committee following presentations made by representatives of potential host states. These presentations are usually made at the Steering Committee meeting, which is held during the Annual Symposium. Upon selection the state representative becomes the state chairman and a member pro tem of the Steering Committee. Depending on interest and degree of participation, the temporary member may gain full membership to the Steering Committee.

The symposia are generally set up for two and one-half days, with a day-and-a-half for technical papers and a full day for the field trip that usually occurs on the second day. In most cases the activities begin on Wednesday morning with the opening session. The field trip is usually set for Thursday, followed by the annual banquet that night. The final technical session usually ends by noon on Friday.

The field trip is the highlight of the meeting. In most cases, the trips traverse from 150 to 200 miles, provide for six to eight scheduled stops, and require about eight hours. Occasional cultural stops are scheduled around geological and geotechnical points of interest. In Wyoming, for example, the group viewed landslides in the Big Horn Mountains; Florida's trip included a tour of Cape Canaveral and the NASA space installation; the Idaho and South Dakota trips dealt principally with mining activities; North Carolina provided stops at a quarry site, a dam construction site, and a nuclear generating site; in Maryland the group visited the Chesapeake Bay hydraulic model and the Goddard Space Center; the Oregon trip included visits to the Columbia River Gorge and Mount Hood; the Central Mineral Region was visited in Texas; and Tennessee provided stops at several repaired landslides in Appalachia.

At the technical sessions, case histories and state-of-the-art papers are the norm. Highly theoretical papers are the exception.

For more information regarding the Symposium, contact any of the steering committee members listed in this publication.

*HIGHWAY GEOLOGY SYMPOSIUM

Medallion Winners

Hugh Chase	- 1970
Tom Parrott	- 1970
Paul Price	- 1970
K. B. Woods	- 1971
R. J. Edmonson	- 1972
C. S. Mullin	- 1974
A. C. Dodson	- 1975
Burrell Whitlow	- 1978
Bill Sherman	- 1980
Virgil Burgat	- 1981
David L. Royster	- 1982
Henry Mathis	- 1982

*In 1969, the Symposium instituted an awards program, and with the support of Mobile Drilling Company of Indianapolis, Indiana designed a plaque to be presented periodically to individuals who have made significant contributions to the HGS over a period of years. The award, a 3 1/2" medallion mounted on a walnut shield and appropriately inscribed, is presented during the banquet at the Annual Symposium.

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1982

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Willard McCasland - Materials Division, Oklahoma Department
of Transportation

Marvin McCauley - California Division of Highways

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Welcome and Opening Remarks

Highway Geology in Colorado And Overview

Abstract

by

J. W. Rold

Colorado Geological Survey

Denver, Colorado

Geologic factors are a major control mechanism for all aspects of Colorado highways. Both the regional and the local topography in Colorado directly result from geological controls. This control ranges from our major valleys and mountain ranges to the smallest canyons. Because of the scale of these major topographic units in Colorado, the major transportation routes themselves--from the days of the Indians and early explorers, to today's interstates--are directly controlled by the regional and local geology. Since early historic times, topography, the soils, and the mineral resources have controlled the location of the population and the service centers, and therefore, the requirements for a transportation system.

Colorado's mineral resource locations, which are obviously governed by the geology, have had a definite shape on our transportation needs. Had gold been discovered at the confluence of St. Vrain and the South Platte instead of Cherry Creek and the South Platte and early gold production established in the St. Vrain or Poudre drainages instead of Clear Creek, the major metropolitan area and capitol of Colorado might well have been Platteville instead of Denver.

The location, character, and intensity of major canyon routes and mountain passes is definitely controlled by the tectonics, the rock character, the geological history, and erosional processes. Not only does the regional geology control the general location of our transportation, and therefore highway corridors, local geologic factors and processes control the specific

Location, designed feasibility, and the cost of not only construction, but also the maintenance and the safety of the roadway.

These factors could be classified under rock characteristics, processes, and hydrology. Specific rock characteristics are hardness or strength, which determine the stability, height, slope, and shape of cut slopes, erodability, bearing strength, rippability, structure relates to dip, strike, and bedding of sedimentary or layered units, foliation, faults, and joints. Stability relates to shrink swell, hydrocompaction, and mine subsidence. Geologic processes include landslides, mud and debris flows, rockfall, avalanches, seismicity, and erosion. Hydrology relates to flood plains, water saturation, seasonal changes, drainage, and hydrology's impact on stability, particularly in landslides and swelling soils.

The manner of investigating, predicting, and mitigating the effects of these geologic factors controls the economics of construction and maintenance and, more importantly, the safety of our highways.

This symposium should address many of these ubiquitous and unique problems of Colorado highways.

Experimental Compaction of Collapsible Soils at Algodones, New Mexico

by

Warren Bennett

Geotechnical Engineer

State of New Mexico Highway Department

In order to determine the efficacy and capabilities of various potential methods of compacting collapsible (hydro-compacting) soils, four methods of compaction were tried in a test program under controlled conditions. The test series included both minimal efforts and established commercial techniques never used on these soils. They included forced wetting, without and with vertical drain channels, and the use of vibroflotation and impact compaction. In addition to determining which methods were effective, the experiment was intended to make the potential contractors and subcontractors aware of the capabilities and limitations of their methods to refine the bidding and maximize the returns.

In addition to explaining the trial methods and the results obtained, the results of the bidding and construction procedures on the two production projects will be discussed, including the methods selected, the specifications used and the apparent savings.

