DISCUSSION

A. I. JOHNSON[1]—Holtz's discussion notes that negative pore pressures existed on many specimens at the beginning of laboratory shear tests. The lack of 100 per cent saturation has been confirmed by the work of the Hydrologic Laboratory in connection with studies of subsidence in the San Joaquin and Santa Clara Valleys, Calif., where over 500 specimens were collected and analyzed. Most specimens collected from core holes at these locations had a degree of saturation of 90 to 95 per cent, although they were collected as much as 1,500 ft below the piezometric surface in the area. J. F. Poland, project chief for U.S. Geological Survey research on subsidence, Sacramento, Calif., has calculated that the specimens of supposedly saturated, clayey soils had porosities under atmospheric pressure conditions averaging approximately 5 per cent greater than the porosities existing under the effective stress of the field-loaded (overburden) conditions. This increase in porosity, resulting from expansion of the specimens as they are removed from the *in situ* condition, is sufficient to cause the previously mentioned reduction in degree of saturation, amounting to approximately 5 to 10 per cent. Although the specimens were collected very carefully by means of well-designed equipment, such as mentioned by Mr. Holtz, and were carefully sealed after collection, the reduction in degree of saturation was common to most specimens regardless of the type of soil. It thus appears that there may be no method of sampling or handling which would prevent expansion of specimens when removed from a depth of at least more than 100 ft.

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W. G. HOLTZ AND W. ELLIS (*authors' closure*)— Mr. Johnson points out in his discussion that even though soil specimens are taken as much as 1,500 ft below ground water level, the specimens may only be 95 per cent saturated when tested at atmospheric pressure conditions. It is recognized that when intergranular and hydrostatic pressures are reduced on soil specimens, dissolved gasses will be expelled and, together with expansion of the specimens, will produce a less-than-saturated condition. These conditions could produce negative pore pressures.

The soils reported by the authors in the paper under discussion were those compacted at near optimum moisture conditions, and, as they were taken at shallow depths, they would always be at some moisture condition less than saturation. As shown in the paper, the degrees of saturation vary from 62.6 to 92.2 per cent. Thus it would be anticipated that the negative pore pressures would be of a different magnitude than the undisturbed specimens discussed by Mr. Johnson.