EXPERIMENTAL DEFORMATION OF LAYERED ROCKS

by

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University of Texas, Ph.D. thesis, 196 p., 12 tables, 91 diags., 24 photos, appendix of 66 p. on graphic and mathematical analysis of stress and strain, June, 1965.

ABSTRACT

Triaxial compression tests were made on a sandstone of Lyons Formation, a shale of Green River Formation, a sandstone of Blackhawk Formation, and a gneiss of Idaho Springs Formation under O; 1,5000; 3,000; and 4,500 psi confining pressure. Similar unconfined tests were made in tension. Cores 2 1/8 by 4 1/4 inches were prepared with the layers dipping at 0^{o}, 15^{o}, 30^{o}, 45^{o}, 60^{o}, 75^{o}, and 90^{o} to the short axis. All tests were carried to failure and strain was measured by gauges mounted on the cores.

The orientation of failure plane and rupture strength are highly affected by layering for all rocks tested, except the shale of the Green River Formation when tested at 3,000 psi confining pressure. Plots of stress difference versus inclination of layering are concave upward with the maximum stress difference for 0^{o} and 90^{o} cores and the minimum for 45^{o} and 60^{o} core orientation. In tension tests, rupture strength increases as the dip increases from 0^{o} to 60^{o}, for which failure occurs along layering for 75^{o} and 90^{o} cores, failure occurs across layering and with a sharp increase in rupture strength.

If faults are parallel to layering, the orientation of the causative stresses cannot be established with certainty in the field. In folded layered rocks deforming in a brittle state, slip between layers is the controlling mechanism in folding until limbs of folds dip 45^{o}. In layered rocks deforming in ductile state, flow within layers is the controlling mechanism in deformation.