Active Faults In The Gulf Coastal Zone

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More than 450 active faults intersect the Earth's surface onshore in the Texas-Louisiana Gulf Coastal Zone, hundreds more have been identified offshore, and each year exploratory efforts uncover a few more. The vast majority are listric normal growth faults with near-surface dips of 70 to 85 degrees.&#65533; The faults extend hundreds to tens of thousands of feet deep, and they have been intermittently active for hundreds of thousands to millions of years.

About 80 percent of the surface faults occur over columns of salt (salt domes), 0.5 to 6.0 miles in diameter, that have risen from depths that may exceed 40,000 feet.&#65533; Most salt dome faults are short, ranging in length from 0.5 to 3.0 miles. They extend over and/or radially outward from the domes. The remainder are 3- to 11-mile long regional faults that trend more or less parallel to the coastline.&#65533; The most active ones are paired with shorter parallelling faults located about 1.5 miles from the parent fault on its downthrown side.&#65533; They occur opposite only the more rapidly moving parts of the parent fault.

Ground movement across all the faults is directly down dip.&#65533; No strike-slip component of motion has yet been identified on any surface fault.&#65533; Rates of dip-slip displacement across the faults vary in both time and space. Currently the highest rates are about 1 in./yr. In the strike direction, the rates decrease progressively from a maximum near the mid-point of the fault to zero at its ends. Movement rates are slow enough to make many of the faults difficult to find and map, but fast enough to cause substantial damage to structures built across them. A 10-mile long fault in west Houston currently damages about 240 buildings.

Gulf Coast faults are aseismic.&#65533; Instead of storing strain energy for tens to hundreds of years and releasing it suddenly, they release energy in small increments each year.&#65533; Individual movement events are in the millimeter to submillimeter range, except when surface waves from distant epicenters trigger centimeter-range events on faults poised for motion.

The faults are not discrete fractures. Rather, they are zones of intensely sheared ground extending a few tens of feet perpendicular to the trend of the fault. For engineering purposes, it is important that the location and width of the fault zones, as well as their sense of motion, be established precisely. Where bench mark data are not available, that information can often be obtained by measuring the extent and vertical amplitude of deformation to structures of known age built across the fault zones.

Thousands of homes, schools, churches, shopping centers and other commercial and public buildings in the Houston Metropolitan Area have been built unknowingly in fault zones. Often the fate of these structures is destruction before their intended life expectancy.&#65533; The role of the geologist is to provide information on the location, sense of motion and rate of motion of the fault zones to planners, developers, architects and structural engineers. Surface faults are considered a fatal flaw for waste disposal facilities. Although there are no local ordinances that prohibit construction of buildings in fault zones, such practice is rarely undertaken.