CASE STUDY: EAGLE CREST, IRVING, TEXAS

Steve Gregory and Jim Roberson

EAGLE CREST is a group of multi-family properties located in North Irving, Texas. This is an area near the DFW Airport and close to the high end development of Las Colinas. North Irving is on the Eagle Ford geological formation. These soils have an extremely volatile shrink swell potential when any change in soil moisture content is introduced.

The property is approximately twenty years old and still in good enough shape to be rated as a strong 'B' rated property.

We have no history on this property and no specific geotechnical information. On this type of property, we can always assume total re-grading of the top soils and all cut and fill type site development. "Cut and fill" simply means soil cut from higher elevations and moved to lower elevations to provide level plots for constructing buildings. To be certain that the water drains downhill and away from the building foundations, all top soil to at least 12" should be removed from the site except if used for landscaping. The top 3-4 feet of all soils should be homogenously mixed, graded to the desired elevation and compacted in 6" lifts. The soil is compacted with equipment that will deliver the desired amount of energy into the compaction process at the correct moisture content for each location and for each soil layer or lift.

In order to achieve proper compaction, there needs to be a geotechnical engineer employed on site to insure that each of the soil layers is compacted to proper density. Density is measured by unit of dry density weight and in the United States it is customary to use measurements calibrated to pounds per cubic foot. Often times, rubber-tired equipment is employed for this task. Weights added to the compactor or taken off the compactor as well as regulating tire pressure will control the amount of energy used to consolidate each lift. If the soils are under compacted, over time, the soil will consolidate and allow the foundation to settle. This process is accelerated by repeated wetting and drying through the changing seasons.

The soils might be over-compacted and maybe a little on the dry side since the foundation was probably poured in the summer. When the rains come and the irrigation system is turned on, the soils begin to swell and the foundation heaves up.

The realities of the construction business are that the geotech has his recommendations, the civil engineers have their recommendations, the owners take the cheapest bid, the general contractor takes his cheapest bid and so on . . .

The soils that are cut to a lower grade get moved on top of top soil full of organics and are compacted with a dozer in whatever lifts that are convenient to shove spread and compact with dozer tracks. Some of the cut soils are much too dense and most of the fill soils are under compacted.

EAGLE CREST (cont.)

At Eagle Crest, improper site preparation led to remedial foundation repair some twenty years after the buildings were built. By this time, they have undergone several remodeling and maintenance phases to path cracks, relay brick realign doors and so on.

Jim Roberson, President of RJT Commercial (a sister company of Ram Jack of Texas), got a call to look at the property with the new owners from California. Jim McNamee, P.E. had done an engineering report on the property earlier. Mr. McNamee and Mr. Roberson have worked through many very difficult jobs through the years. The Eagle Crest job would be no exception.

The differential elevations on the building to be repaired showed the building to be 19" out of level. It is quite possible that the high side of the building heaved up within the first few years after construction and the low side of the building settled a little each year over the life of the structure. The settlement is initiated each wet and dry weather cycle with moisture acting on the expansive clay soils.

The repair offered some unique challenges. The foundation is a post-tensioned monolithic slab on grade. The slab has a perimeter foundation but no interior grade beams so it could be considered a semi-structural slab.

Ram Jack® hydraulically driven steel pressed piers were driven on the perimeter and on the interior load-bearing walls wherever practical. Most of the piers were driven to between 40 and 45 feet. Final driving forces on the piers drove them with 70,000 pounds of force.

The heavy loads, the soft soils and high driving pressures required the use of 8 ft. guide sleeves in order to relieve the lateral forces being exerted on the piers.

The slab floor did not have sufficient strength to completely bridge between the piers on the load-bearing walls. A wide flange steel beam (see picture to right) was welded to the horizontal arm of the pier bracket. This was welded in place after the pier was set up but before pier driving began.

Post-tension cables can be observed through many of the access holes in the slab floor (see picture at left). These cables should be tensioned to within 90% of their yield strength or around 27,000 lbs. for a 1/2" cable. Some of the cables can be seen to be loose and have slack in them. The purpose of the cables is to keep the concrete rigid by exerting compression forces into the concrete through tension. A rotary drill and pavement breaker were used to create the access holes through the slab. This method was chosen to prevent the possibility of cutting through the cables while creating the access holes.

The interior floor slab and the interior non-load bearing walls are supported on helix piers using floor slab brackets that utilize hand operated hydraulic jacks for lifting.

The lift on the 60 ft. by 150 ft. building was accomplished with 135 hydraulic jacking systems while being carefully raised simultaneously as required for a uniform lift. During the lifting process elevations were carefully monitored and documented after each selective lift phase.

Needless to say, the apartment had to be vacated prior to the work and the plumbing and electrical services needed some attention. The differential elevations were corrected within 2 inches across the entire building.

Jim Roberson has developed lasting relationships through the years by working trade shows, prospecting and networking with engineers and property managers throughout the Dallas-Ft. Worth Metroplex. Jim is responsible for almost all of the Ram Jack commercial revenue produced in North Texas.