

**JULY 12, 2006** - Advances in Auger Pressure Grouted Piles: Design, Construction and Testing

Speaker: [Tracy Brettman, P.E.](#) with [Beckel & Company Contractors, Inc.](#) Tel: 281-344-1090

## PRESENTATION SUMMARY

To a room of about 50, Tracy Brettman, P.E. Regional Manager for Berkel and Company Contractors, Inc. (Houston office) gave a presentation entitled, "Advances in Auger Pressure Grouted Piles." Mr. Brettman is a licensed professional engineer in Texas and Louisiana and has earned a BS in Civil Engineering from the University of Nebraska and an MS in Geotechnical Engineering from UT Austin.

Mr. Brettman's presentation included the design, construction, and testing of Auger Pressure Grouted (APG) piles, also known as Augered Cast-In-Place (AGIP) piles. He listed advantages over other types of piles as: faster to install; higher capacity; more economic; minimal vibration; and independent of soil conditions. He said his company can install APG piles down to 120 ft. penetration and with diameters as large as 36 in.



Mr. Brettman said his company also installs APG piles that are partial or full Displacement (called APGD), for use in loose or soft soils. The drill string consists of a short auger with a solid collar above and a smooth and smaller-diameter drill stem to the surface. The collar displaces the soil cuttings laterally to help keep the hole open. A special drill rig from Europe is needed to install APGD piles that has several times the torque than the crawler cranes used for APG piles provides.

Mr. Brettman said the steps for constructing AGP piles are:

1. Drill to depth
2. Blow the end plug by pumping grout
3. Continue pumping through the drill string to build a grout head at the tip
4. Withdraw the auger at a constant rate while pumping 115% to 150% of theoretical volume
5. Remove the spoils at the surface
6. Install reinforcing and/or sonic tubes as applicable
7. Adjust pile cap to final elevation.
8. Provide final quality control testing

Mr. Brettman also discussed a low headroom AGP that could be installed with as little as 8.5 ft. overhead clearance. This method entails the use of short auger joints, a forklift for lifting and lowering (rather than a crawler crane), and a budget of 3 to 5 times that of comparable AGP piles installed with a crane.

According to Mr. Brettman, the best design methods to follow are: TxDOT or APR-RP2A for AGP piles in clay; FHWA or Stephano's Beta Method for AGP piles in sand; and NeSmith's (2002) method for APGD piles. Normal 28-day compressive strength ( $f'_c$ ) used for the grout is 4000 psi, although 3000 psi and 5000 psi may also be used depending on design loads, amount of reinforcing, and the boring logs. IBC 2003 allows a bearing pressure on AGP piles of  $0.33f'_c$ , whereas IBC 2000 only allows  $0.25f'_c$ .

Mr. Brettman said current testing and quality assurance procedures available include (1) automated pile installation monitoring equipment, (2) non-destructive testing (NDT), and (3) grout maturity strength testing procedures. While the more reliable NDT methods include casting PVC sonic tubes for dropping transmitters and receivers down the length of the pile, Mr. Brettman felt using the grout maturity method was the better approach. This method requires that sensors be cast along the pile and that ASTM C1074 be followed.

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