

Session D – Brady

Information from borehole logs

Garen N. Ewbank

Ewbank Geo Testing, LLC

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- INFORMATION FROM BOREHOLE LOGS
 - Garen N. Ewbank, CEM, CRM, CEA, CSDP, CBEP
 - OG+E APPLIED RESEARCH PROJECT
 - HABITAT FOR HUMANITY
 - HOPE CROSSING, OKLAHOMA CITY, OKLAHOMA

INFORMATION FROM BOREHOLE LOGS

- EIGHT (8) SITES (EXISTING HOMES) NEAR NE 83RD, AND KELLY IN OKLAHOMA CITY
- THIRTEEN BOREHOLES (13), GROUND SOURCE WITH DIFFERENT GROUND HEAT EXCHANGER CONFIGURATIONS

OVERVIEW OF THE DESIGN OF THE GROUND HEAT EXCHANGER DESIGNS

- κ , THERMAL CONDUCTIVITY AT ALL SITES DESIGNED WITH 1.6 BTU/(HR-FT-°F)
- DEEP EARTH TEMPERATURE OF SIXTY-THREE (63)°F
- ACCA MANUAL J FOR THE HVAC LOADS OF THE HOMES

PREVIOUS STATE OF CONSIDERATIONS

- BOREHOLE RESISTANCE IS IN SERIES
- COMPONENTS:
 - FILM RESISTANCE OF THE CIRCULATING FLUID
 - PIPING RESISTANCE
 - GROUT RESISTANCE
 - SHAPE FACTORS

PREVIOUS STATE OF CONSIDERATIONS

- BOREHOLE RESISTANCE:
- FOR HDPE UNICOIL

$$R_B = R_{\text{GROUT}} + R_{\text{PP}}$$

$$R_{\text{PP}} = R_p/2$$

$$R_{\text{GROUT}} = 1 / (S_B * K_{\text{GROUT}})$$

FOR CONCENTRIC

$$R_B = R_{\text{GROUT}} + R_p$$

$$R_p = (\text{Ln}(\text{O.D./I.D.})) / (2 * \pi * K_p)$$

$$R_{\text{GROUT}} = (\text{Ln}(\text{B.D./O.D.}_p)) / (2 * \pi * K_{\text{grout}})$$

ADDITIONAL CONSIDERATIONS

- ACTUAL THERMAL CONDUCTIVITY OF THE PUMPED GROUT
- DEVIATION FROM VERTICAL
- INVASION OF DRILLING AIR/FLUIDS AND CUTTINGS
 - ZONES OR STRATA WITH GOOD POROSITY AND PERMEABILITY

ADDITIONAL CONSIDERATIONS

- ONE CAN MEASURE THE κ OF THE GROUT
- AND WITH THIS RESEARCH THE DEVIATION AND INVASION WERE STUDIED

ADDITIONAL CONSIDERATIONS

- TO STUDY THE DEVIATION AND INVASION A SUITE OF ELECTRONIC LOGS WERE CONDUCTED
- RAN IMMEDIATELY AFTER DRILLING AND BEFORE LOOP
- BOREHOLES WERE KEPT FULL OF FLUID DURING LOGGING

ELECTRIC LOGGING OF BOREHOLES

- 5 SUITE

- NATURAL GAMMA (CPS, COUNT PER SECOND)

- SPONTANEOUS POTENTIAL
(MILLIVOLTS, mV)

- SINGLE POINT RESISTANCE (OHMS)

- 16 INCH NORMAL RESISTANCE (OHMS
PER METER)

- 64 INCH NORMAL RESISTANCE (OHMS
PER METER)

ELECTRIC LOGGING OF BOREHOLES

- **DEVIATION LOG** (MAGNETIC DECLINATION AS TOOL TRAVELS IN HOLE FROM SURFACE)
- **CALIPER LOG** (MEASURED BORHOLE DIAMETER USING THREE POINTS)

ELECTRIC LOGGING OF BOREHOLES

- LOGS OF BOREHOLES AT HOPE CROSSING
- 928 NE 83RD
- 932 NE 83RD
- 944 NE 83RD
- 813 NE 83RD
- 833 NE 83RD

THANKS

- GROUND SOURCE VISION:
 - TARIFF
 - PLAYBOOK
 - JOBS