NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

ROCK DESCRIPTION SOIL DESCRIPTION GRADATION TERMS AND DEFINITIONS WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COAR UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL, ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. AQUIFER - A WATER BEARING FORMATION OR STRATA. GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO 1206, ASTM D-1586), SOIL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZON LOW SEA TO THE COMMING TO STANDARD FEMELIATION TEST MAISTIC 1206, AST DESCRIPTION (CASSIFICATION IS BASED ON THE ASSHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ANGULARITY OF GRAINS ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS: RGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. WEATHERED SUBANGULAR, SUBROUNDED, OR ROUNDED. NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERREDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 ROCK (WR) ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL MINERALOGICAL COMPOSITION SOIL LEGEND AND AASHTO CLASSIFICATION AT WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THA CRYSTALLINE ROCK (CR) GROUND SURFACE. WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS GENERAL WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE CLASS. (\$5% PASSING *200) (>85% PASSING *200) CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN NON-CRYSTALLINE A-1 A-3 A-1. A-2 A-4. A-5 COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM GROUP EDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED. ROCK TYPE
INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD A-6- A-7 CLASS. 4-1-a 4-1-h SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 TOASTAL PLATE MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SYMBOL HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50 EDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC PERCENTAGE OF MATERIAL PASSING DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT WEATHERING RANULA GRANULAR SILT- CLAY ROCKS OR CUTS MASSIVE ROCK. CLAY ORGANIC MATERIAL OTHER MATERIAL * 40 30 MXI50 MXI51 MN PEAT SOTIS SOILS SULUS SOILS ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 RACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% HAMMER IF CRYSTALLINE. ITTLE ORGANIC MATTER 5 - 12% LITTLE MX41 MN 40 MX41 MN 40 MX 41 MN 40 MX41 MI 10 - 20% LIQUID LIMIT VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. MODERATELY ORGANIC SOILS WITH 5 - 10% 12 - 20% SOME 20 - 35% DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF N.P. 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF astic inde HIGHLY ORGANIC >20% V. SLI.) >107 35% AND ABOVE LITTLE OR OF A CRYSTALLINE NATURE. 8 MX 12 MX 16 MX No M MODERATE GROUP INDEX Ø ø 4 MX GROUND WATER FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE ORGANI ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO SOILS SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE ISUAL TYPES STONE FRAGS 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. (SLIJ) FINE SILTY OR CLAYEY ORGANIC OF MAJOR GRAVEL AND CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. GRAVEL AND SANE SOILS SOILS ▼___ STATIC WATER LEVEL AFTER 24 HOURS. TERIAL S SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN MODERATE FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM GEN RATING **∇**PW GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS FAIR TO PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA EXCELLENT TO GOOD FAIR TO POOR POOR AS A UNSUITAB DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED POOR FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. OM-SPRING OR SEEPAGE WITH FRESH ROCK. PI OF 4-7-5 < 11 - 30 . PI OF 4-7-6 > 11 ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL MODERATELY CONSISTENCY OR DENSENESS MISCELLANEOUS SYMBOLS AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN RANGE OF UNCONFINED (MOD, SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK. COMPACTNESS OR ENETRATION RESISTENCE ROADWAY EMBANKMENT POPT ONT TEST BORING COMPRESSIVE STRENGTH (TONS/FT²) IF TESTED, WOULD YIELD SPT REFUSAL PRIMARY SOIL TYPE SAMPLE JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. CONSISTENCY WITH SOIL DESCRIPTION (N-VALUE) DESIGNATIONS ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCE! SEVERE <u>LEDGE</u> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. VERY LOOSE IN STRENGTH TO STRONG SOIL, IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME - SOIL SYMBOL AUGER BORING (SEV.) GENERALLY S- BULK SAMPLE EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. 4 TO 10 GRANULAR MEDIUM DENSE N/A FNS - A BODY OF SOIL OR BOCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. IF TESTED, YIELDS SPT N VALUES > 100 BPF ARTIFICIAL FILL OTHER THAN MATERIAL SS- SPLIT SPOON DENSE 30 TO 50 ROADWAY EMBANKMENTS MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SAMPLE VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT (NON-COHESIVE) VERY DENSE SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. ST- SHELBY TUBE THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK INFERRED SOIL BOUNDARIES M*O PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN VERY SOF SAMPLE REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR <0.25 MONITORING WELL VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF NTERVENING IMPERVIOUS STRATUM. GENERALLY 0.25 TO 0.5 RS- ROCK SAMPLE INFERRED ROCK LINE PIEZOMETER MEDIUM STIFF SILT-CLAY 4 TO 8 ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND Ø.5 TO 1 Δ RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK INSTALLATION 8 TO 15 MATERIAL 1 TO 2 ALLUVIAL SOIL BOUNDARY RT- RECOMPACTED SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND VERY STIFF 15 TO 30 TRIAXIAL SAMPLE SLOPE INDICATOR $\langle \rangle$ DIP/DIP DIRECTION OF CBR - CBR SAMPLE EXPRESSED AS A PERCENTAGE. ROCK STRUCTURES ROCK HARDNESS TEXTURE OR GRAIN SIZ SPT N-VALUE \bigcirc SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SOUNDING ROD U.S. STD. SIEVE SIZE REF- SPT REFUSAL SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK. 4.76 20 0.42 0.25 0.075 0.053 STILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND PENING (MM) CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL COARSE TO DETACH HAND SPECIMEN. TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS AR - AUGER REFUSAL PMT - PRESSUREMETER TEST CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE (BLDR.) (COB.) (GR) (SL.) (CL.) SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. BT - BORING TERMINATED SD. - SAND, SAND) HARD EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK, HAND SPECIMENS CAN BE DETACHED SL. - SILT, SILTY - CLAY 305 2.0 0.25 0.05 0.005 BY MODERATE BLOWS. CPT - CONE PENETRATION TEST SLI. - SLIGHTLY STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.,) OF SIZE IN. 12" CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT, MEDIUM TCR - TRICONE REFUSAL A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH CSE. - COARSE CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE SOIL MOIST JRE - CORRELATION OF TERMS DMT - DILATOMETER TEST γ - UNIT WEIGHT A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION POINT OF A GEOLOGISTS PICK. DPT - DYNAMIC PENETRATION TEST SOIL MOISTURE SCALE FIELD MOISTURE WITH 60 BLOWS. $\gamma_{\rm d}$ - DRY UNIT WEIGHT GUIDE FOR FIELD MOISTURE DESCRIPTION VOID RATIO SOFT CAN BE GROVED OR GOUGED READILY BY KNIFF OR PICK, CAN BE EXCAVATED IN FRAGMENTS (ATTERRERG | IMITS) STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. W - MOISTURE CONTENT FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN F. - FINE FOSS - FOSSILIFEROUS V. - VERY PIECES CAN BE BROKEN BY FINGER PRESSURE - SATURATED USUALLY LIQUID: VERY WET. USUALLY VST - VANE SHEAR TEST STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: FRAC. - FRACTURED FROM BELOW THE GROUND WATER TABLE CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH (SAT.) FRAGS. - FRAGMENTS OTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED TIMI I OILIOI I SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE MED. - MEDIUM PLASTIC FINGERNAIL SEMISOLID: REQUIRES DRYING TO TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. RANGE - WET - (W) EQUIPMENT USED ON SUBJECT PROJECT FRACTURE SPACING BEDDING ATTAIN OPTIMUM MOISTURE (PI) PLASTIC LIMIT TERM THICKNESS HAMMER TYPE: TERM SPACING BENCH MARK DRILL UNITS: ADVANCING TOOLS VERY THICKLY BEDDED > 4 FEET VERY WIDE MORE THAN 10 FEET OPTIMUM MOISTURE - MOIST - (M SOLID: AT OR NEAR OPTIMUM MOISTURE X AUTOMATIC MANUAL THICKLY BEDDED 1.5 - 4 FEET CLAY BITS 3 TO 10 FEET ELEVATION: MOBILE B-THINLY REDDED 0.16 - 1.5 FEET SHRINKAGE LIMIT MODERATELY CLOSE 1 TO 3 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET 6° CONTINUOUS FLIGHT AUGER CORE SIZE CLOSE 0.16 TO 1 FEET REQUIRES ADDITIONAL WATER TO NOTES: THICKLY LAMINATED 0.008 - 0.03 FFFT ~ DRY ~ (D) BK-51 VERY CLOSE LESS THAN 0.16 FEET ATTAIN OPTIMUM MOISTURE X 8" HOLLOW AUGERS < 0.008 FEET THINLY LAMINATED INDURATION PLASTICITY HARD FACED FINGER BITS CME-45 X - N XWLFOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. PLASTICITY INDEX (PI) DRY STRENGTH X TUNG.-CARBIDE INSERTS ___-H__ NONPLASTIC VERY LOW X CME-550 RUBBING WITH FINGER FREES NUMEROUS GRAINS: 0-5 $oldsymbol{X}$ casing $oldsymbol{X}$ w/ advancer FRIABLE LOW PLASTICITY SLIGHT GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. HAND TOOLS: MEDIUM MED. PLASTICITY 16-25 X TRICONE 2.7/8 STEEL TEETH PORTABLE HOIST GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; POST HOLE DIGGER HIGH PLASTICITY MODERATELY INDURATED 26 OR MORE HIGH BREAKS EASILY WHEN HIT WITH HAMMER X TRICONE 2 15/16 TUNG.-CARB. HAND AUGER OTHER GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE: INDURATED SOUNDING ROD X CORE BIT DIFFICULT TO BREAK WITH HAMMER DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN. RED. YEL-BRN. BLUE-GRAY) VANE SHEAR TEST OTHER OTHER SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. EXTREMELY INDURATED OTHER REVISED 09/15/00