NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

TERMS AND DEFINITIONS SOIL DESCRIPTION GRADATION WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE, (ALSO POORLY GRADED) SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR VEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED MITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOVS PER FOOT ACCORDING TO STANDARD PENETRATION TEST JACSHIO TESG, ASTM D-1580S. SOIL CLASSIFICATION IS BASED ON THE AASHTD SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. ADUIFER - A WATER BEARING FORMATION OR STRATA. GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ANGULARITY OF GRAINS CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO, CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS: ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR. NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION AS SHALE, SLATE, ETC. WEATHERED NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 1990 BLOWS SUBANGULAR, SUBROUNDED, OR ROUNDED. VERY STIFF, GRAY SUTY CLAY, MOIST WITH INTERPEDDED FINE SAND LIVERS, HIGHLY PLASTIC, A-7-6 ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL SOIL LEGEND AND AASHTO CLASSIFICATION MINERALOGICAL COMPOSITION AT WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THA MINERAL NAMES SUCH AS OUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. GROUND SUBFACE. WOULD YIELD SPT REFUSAL IF TESTED, ROCK TYPE INCLUDES GRANITE, GENERAL GRANUI AR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS GNEISS, GABBRO, SCHIST, ETC. CALCAREDUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. CLASS. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE NON-CRYSTALLINE ROCK (NCR) COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM A-1, A-2 A-4, A-5 A-1 A-3 A-4 A-5 A-6 A-7 GROUP A-3 INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.

COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD CLASS. A-2-4 A-2-5 A-2-6 A-2-7 SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 COASTAL PLAIN SEDIMENTARY ROCK <u>CORE RECOVERY (REC.)</u> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. MODERATELY COMPRESSIBLE LIDUID LIMIT 31-50 SYMBOL 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 SII T-SILT- CLAY BOCKS OR CUTS MASSIVE BOCK. CLAY ORGANIC MATERIAL OTHER MATERIAL PEAT SOTUS SOILS SDILS DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE SDILS FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER • 200 RACE OF ORGANIC MATTER 1 - 10% DRIZONTAL. .ITTLE ORGANIC MATTER 3 - 54 5 - 12% LITTLE 10 - 20% 40 MX41 MN 40 MX41 MN 40 MX41 MN 40 MX41 MN ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, MODERATELY DRGANIC DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF PLASTIC INDEX 6 MX N.P. 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN (V. SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF HE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. IGHLY ORGANIC >20% LITTLE OR HIGHLY 35% AND ABOVE HIGHL OF A CRYSTALLINE NATURE. GROUP INDEX 0 0 4 MX 8 MX 12 MX 16 MX No MX FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE 0 GROUND WATER ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO USUAL TYPES STONE FRAGS. FINE AMOUNTS OF SDILS ORGANIC WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR OF MAJOR GRAYEL AND SAND SILTY OR CLAYEY CLAYEY CRYSTALS ARE DULL AND DISCOLDRED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. MATTER GRAVEL AND SAND SOUS SOILS **Y**_ STATIC WATER LEVEL AFTER 24 HOURS. MATERIALS SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN MODERATE FUNAT - BOCK FRAGMENTS ON SUBFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM GEN. RATIN VPW. GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA POOR EXCELLENT TO GOOD INSUITARI FATE TO POOR AS A DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED POOR SUBGRADI FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. OM-SPRING OR SEEPAGE WITH FRESH ROCK. P.I. OF A-7-5 \leq L.L. - 30 : P.I. OF A-7-6 > L.L. - 30 ALL BOCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID BOCKS, ALL FELDSPARS DULL MODERATELY AND DISCOLORED AND A MAJORITY SHOW KACLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. MISCELLANEOUS SYMBOLS FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN CONSISTENCY OR DENSENESS RANGE OF UNCONFINED (MOD, SEV.) COMPACTNESS OR CONSISTENCY ROADWAY EMBANKMENT DPT DAT TEST BORING PRIMARY SOIL TYPE SAMPLE DESIGNATIONS IF TESTED, WOULD YIELD SPT REFUSAL JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. WITH SOIL DESCRIPTION ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED (N-VALUE) SEVERE LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO VERY LOOSE \oplus IN STRENGTH TO STRONG SOIL, IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME AUGER BORING GENERALLY S- BULK SAMPLE EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. MEDIUM DENSE N/A LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. SS- SPLIT SPOON IF TESTED, YIELDS SPT N VALUES > 100 BPF 10 TO 30 ARTIFICIAL FILL OTHER THAN MATERIAL CORE BORING DENSE 30 TO 50 MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT (NON-COHESIVE) VERY DENSE ST- SHELBY TUBE THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAMENTS OF STRONG ROCK REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR (V. SEV.) INFERRED SOIL BOUNDARIES PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN VERY SOFT ** SAMPLE MONITORING WELL VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. JF TESTED, YIELDS SPT N VALUES < 100 BPF INTERVENING IMPERVIOUS STRATUM. GENERALLY RS- ROCK SAMPLE 0.25 TO 0.5 INFERRED ROCK LINE PIEZOMETER MEDIUM STIFF 4 TO 8 0.5 TO 1 SILT-CLAY RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. Δ COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND MATERIAL (COHESIVE) STIFF B TO 15 INSTALLATION RT- RECOMPACTED ALLUVIAL SOIL BOUNDAR SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ROCK QUALITY DESIGNATION (R.Q.Q.) - 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 2 TD 4 SLOPE INDICATOR $\langle \rangle$ DIP/DIP DIRECTION OF CBR - CBR SAMPLE ROCK HARDNESS EXPRESSED AS A PERCENTAGE. ROCK STRUCTURES TEXTURE OR GRAIN SIZE - SPT N-VALUE 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 REDUIRES - SOUNDING ROD REF - SPT REFUSAL J.S. STD. SIEVE SIZE 0.42 0.25 0.075 0.053 SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND 2.0 OPENING (MM) 4.76 ABBREVIATIONS HARD CAN BE SCRATCHED BY KNIFE OR PICK DNLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL COARSE TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS BOLIL DEB CORRL F GRAVEI AR - AUGER REFUSAL PMT - PRESSUREMETER TEST MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE (COB.) (GR.) (SLJ) (CL.) SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR BT - BORING TERMINATED SD. - SAND, SANDY EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK, HAND SPECIMENS CAN BE DETACHED SL. - SILT, SILTY SLI. - SLIGHTLY · CLAY 0.25 0.05 0.005 2.0 MM 305 IN. 12* CPT - CONE PENETRATION TEST STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH SIZE MEDIUM HARD CAN BE GROOVED OR GOLIGED AWS INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT CSE. - COARSE
DMT - DILATOMETER TEST TCR - TRICONE REFUSAL CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE IRE - CORRELATION OF TERMS SOIL MOIS 7 - UNIT WEIGHT A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN ØL FOOT PENETRATION POINT OF A GEOLOGISTS PICK. DPT - DYNAMIC PENETRATION TEST SOIL MOISTURE SCALE FIELD MOISTURE 7d - DRY UNIT WEIGHT GUIDE FOR FIFLD MOISTURE DESCRIPTION e - VOID RATID SOFT CAN BE GROVED OR GOLIGED READLLY BY KNIEF OR PICK. CAN BE EXCAVATED IN ERAGMENTS STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN W - MOISTURE CONTENT FOSS. - FOSSILIFEROUS V. - VERY PIECES CAN BE BROKEN BY FINGER PRESSURE. - SATURATED -USUALLY LIQUID: VERY WET, USUALLY STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY:
TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED
BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. FRAC. - FRACTURED VST - VANE SHEAR TEST VERY CAN BE CARVED WITH KNIFF CAN BE EXCAVATED READILY WITH POINT OF PICK PIECES 1 INCH (SAT.) FRAGS. - FRAGMENTS LIOUID LIMIT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY MED. - MEDIUM FINGERNAIL LASTIC SEMISOLID: REQUIRES DRYING TO TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. EQUIPMENT USED ON SUBJECT PROJECT RANGE - WET - (W) FRACTURE SPACING ATTAIN OPTIMUM MOISTURE TFRM THICKNESS PLASTIC LIMIT HAMMER TYPE: TERM SPACING. BENCH MARK: N/A ADVANCING TOOLS DRILL UNITS: VERY THICKLY BEDDED > 4 FEET VERY WIDE MORE THAN 10 FEET AUTOMATIC MANUAL - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE OPTIMUM MOISTURE 3 TO 10 FEET CLAY BITS ELEVATION: N/A MOBILE B-0.16 - 1.5 FEET THINLY BEDDED SHRINKAGE LIMIT MODERATELY CLOSE 1 TO 3 FEET VERY THINLY BEDDED 0 03 - 0 16 FFFT 6. CONTINUOUS FLIGHT AUGER RECUIRES ADDITIONAL WATER TO NOTES: THICKLY LAMINATED - DRY - (D) BK-51 VERY CLOSE LESS THAN 0.16 FEET ATTAIN OPTIMUM MOISTURE 8 HOLLOW AUGERS -в____ THINLY LAMINATED < 0.008 FEET PLASTICIT HARD FACED FINGER BITS CME-45C -N____ FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. PLASTICITY INDEX (PI) DRY STRENGTH TUNG.-CARBIDE INSERTS __-H___ RUBBING WITH FINGER FREES NUMEROUS GRAINS: NONPLASTIC VERY LOW CME-550 Ø-5 FR1ABLE CASING W/ ADVANCER GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. LOW PLASTICITY 6-15 HAND TOOLS: MED. PLASTICITY 16-25 26 OR MORE MEDIUM TRICONE PORTABLE HOIST *STEEL TEETH POST HOLE DIGGER GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; MODERATELY INDURATED HIGH PLASTICIT BREAKS EASILY WHEN HIT WITH HAMMER. TRICONE HAND AUGER * TUNG-CARR. OTHER SIMCO-4000 GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE. INDURATED SOUNDING ROD CORE BIT DIFFICULT TO BREAK WITH HAMMER DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN. RED. YEL-BRN. BLUE-GRAY) VANE CHEAR 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 SAMPLE BREAKS ACROSS GRAINS.