NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION GRADATION ROCK DESCRIPTION TERMS AND DEFINITIONS WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARS 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 SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS 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.
IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO 1206, ASTM D-1586), SOIL GORLY GRADED. SAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES, AGUIFER - A WATER BEARING FORMATION OR STRATA. TOO BLUMS FER FOUT MCCOMDING TO STANDARD FEMERATION TEST MADSHIP 1206, ASIM 0-13361, SUIL CLASSIFICATION IS BASED ON THE ASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDI CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: ANGULARITY OF GRAINS ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLDWS. THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS. NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 SUBANGULAR, SUBROUNDED, OR ROUNDED. HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL SOIL LEGEND AND AASHTO CLASSIFICATION MINERALOGICAL COMPOSITION FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT S IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE CRYSTALLINE ROCK (CR) SILT-CLAY MATERIALS GENERAL GRANIII AR MATERIAI S MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WOULD YIELD SPT REFUSAL IF TESTED, ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. GROUND SURFACE. ORGANIC MATERIALS CLASS. (\$5% PASSING *200) >85% PASSING *200) ALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COMPRESSIBILITY FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLA GROUP A-4 A-5 A-6 A-A-1, A-2 A-4, A-5 NON-CRYSTALLINE ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.

COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-A-6. A-7 CLASS. SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 LIQUID LIMIT 31-50 LIQUID LIMIT GREATER THAN 50 MODERATELY COMPRESSIBLE COASTAL PLAIN SEDIMENTARY ROCK SYMBOL ORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL ENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED . PASSING PERCENTAGE OF MATERIAL SII T-DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT GRANULAR SILT- CLAY CLAY ORGANIC MATERIAL OTHER MATERIAL SOILS PEAT ROCKS OR CUTS MASSIVE ROCK. SOILS SOILS 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 RESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HAMMER IF CRYSTALLINE. ITTLE ORGANIC MATTER 5 - 12% LITTLE 10 - 20% IORIZONTAL. LIQUID LIMIT SOTI S WITH MODERATELY ORGANIC 5 - 10% 12 - 207 VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, SOME 20 - 35% LASTIC INDE IP 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 (V. SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF LITTLE OR >10% >20% HIGHLY 35% AND ABOVE HE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH MODERATE OF A CRYSTALLINE NATURE. GROUP (NDE) 4 MX 8 MX 12 MX 16 MX No M GROUND WATER FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE AMOUNTS OF ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO SOILS USUAL TYPES STONE FRAGS ∇ SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. SILTY OR CLAYEY ORCANIC WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. FINE CLAYEY 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAF (SLI.) OF MAJOR GRAVEL AND SAND SOILS SOILS MATTER **Y** CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. SAND STATIC WATER LEVEL AFTER 24 HOURS. SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN MODERATE GEN. RATIN FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM VPW. FAIR TO PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA (.COM GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS AS A EXCELLENT TO GOOD FAIR TO POOR POOR POOR SUBGRADE DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED O-M-FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY SPRING OR SEEPAGE P.I. OF A-7-5 ≤ L.L. - 30 : P.I. OF A-7-6 > L.L. - 30 MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, IN GRANITOID ROCKS, ALL FELDSPARS DULL 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 STANDARD ENETRATION RESISTENCE RANGE OF UNCONFINED COMPACTNESS OR CONSISTENCY (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK. THE FIELD. PRIMARY SOIL TYPE COMPRESSIVE STRENGTH (TONS/FT2) ROADWAY EMBANKMENT DPT DMT TEST BORING IF TESTED, WOULD YIELD SPT REFUSAL JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. WITH SOIL DESCRIPTION (N-VALUE) DESIGNATIONS ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED SEVERE VERY LOOSE LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME GENERALL Y - SOIL SYMBOL AUGER BORING S- BULK SAMPLE 4 TO 10 ITS LATERAL EXTENT. EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. GRANULAR MEDIUM DENSE N/A IF TESTED YIELDS SPT N VALUES > 100 BPF MATERIAL ARTIFICIAL FILL OTHER THAN SS- SPLIT SPOON LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. DENSE 30 TO 50 CORE BORING (NON-COHESIVE ROADWAY EMBANKMENTS SAMPLE. VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BU MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN VERY DENSE ST- SHELBY TUBE SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK VERY SOF INFERRED SOIL BOUNDARIES ,**O REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN <0.25 MONITORING WELL VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF 0.25 TO 0.5 INFERRED ROCK LINE RS- ROCK SAMPLE NTERVENING IMPERVIOUS STRATUM. STLT-CLAY MEDIUM STIFF 4 TO 8 PIF70METER 0.5 TO 1 Δ ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. 1 TO 2 2 TO 4 INSTALLATION RT- RECOMPACTED SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS VERY STIFF (COHESIVE) 15 TO 30 ROCK QUALITY DESIGNATION (R.O.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 TRIAXIAL SAMPLE SLOPE INDICATOR ALSO AN EXAMPLE. \bigcirc DIP/DIP DIRECTION OF INSTALLATION CBR - CBR SAMPLE ROCK HARDNESS TEXTURE OR GRAIN SIZE EXPRESSED AS A PERCENTAGE. \bigcirc 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 REQUIRES - SOUNDING ROD U.S. STD. SIEVE SIZE REF)-SPT REFUSAL SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK. OPENING (MM) 4.76 2.0 0.42 0.25 0.075 SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED **ABBREVIATIONS** RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS COARSE COBBLE GRAVEL TO DETACH HAND SPECIMEN. SILT CLAY AR - AUGER REFUSAL SAND PMT - PRESSUREMETER TEST (BLDR.) (COB.) (GR.) (SL.) (CL.) MODERATE! Y CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE CSF, SD. BT - BORING TERMINATED SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. SD. - SAND, SANDY EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED SL. - SILT, SILTY SLI. - SLIGHTLY GRAIN MM 0.25 CL. - CLAY 0.05 0.005 CPT - CONE PENETRATION TEST SIZE IN. 12 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 CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CSE. - COARSE TCR - TRICONE REFUSAL SOIL MOISTURE - CORRELATION OF TERMS DMT - DILATOMETER TEST CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE 7 - UNIT WEIGHT A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION DPT - DYNAMIC PENETRATION TEST POINT OF A GEOLOGISTS PICK. SOU MOISTURE SCALE FIFLD MOISTURE 7 - DRY UNIT WEIGHT GUIDE FOR FIELD MOISTURE DESCRIPTION VOID RATIO CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS (ATTERBERG LIMITS) DESCRIPTION w - MOISTURE CONTENT 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 FOSS, - FOSSILIFEROUS PIECES CAN BE BROKEN BY FINGER PRESSURE. - SATURATED USUALLY LIQUID: VERY WET, USUALLY FRAC. - FRACTURED VST - VANE SHEAR TEST (SAT.) FROM BELOW THE GROUND WATER TABLE STRATA ROCK QUALITY DESIGNATION (S.R.O.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH LIQUID LIMIT FRAGS. - FRAGMENTS SOFT 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. OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY MED. - MEDIUM LASTIC FINGERNAIL. SEMISOLID; REQUIRES DRYING TO RANGE - WET - (W) EQUIPMENT USED ON SUBJECT PROJECT ATTAIN OPTIMUM MOISTURE FRACTURE SPACING TOPSOIL (T.S.) - SURFACE SOILS LISHALLY CONTAINING ORGANIC MATTER BEDDING PLASTIC LIMIT TERM TERM THICKNESS SPACING BENCH MARK: BM# 15 IN HEADWALL STA. 22+02.20 -L-DRILL UNITS: ADVANCING TOOLS: VERY WIDE VERY THICKLY BEDDED > 4 FEET - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE MORE THAN 10 FEET OPTIMUM MOISTURE AUTOMATIC MANUAL CLAY BITS THICKLY BEDDED 1.5 - 4 FEET WITH 3 TO 10 FEET _ SHRINKAGE LIMIT MOBILE B-ELEVATION: 4.47' THINLY REDDED 0.16 - 1.5 FFFT MODERATELY CLOSE 1 TO 3 FEET 6 CONTINUOUS FLIGHT AUGER VERY THINLY BEDDED 0.03 - 0.16 FEE REGUIRES ADDITIONAL WATER TO CORE SIZE: - DRY - (D) NOTES: THICKLY LAMINATED 0.008 - 0.03 FFFT ATTAIN OPTIMUM MOISTURE VERY CLOSE LESS THAN 0.16 FEET 8' HOLLOW AUGERS -B_ THINLY LAMINATED < 0.008 FEET PLASTICITY INDURATION CME-45B HARD FACED FINGER BITS -N ____ PLASTICITY INDEX (PI) FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. DRY STRENGTH TUNG-CARBIDE INSERTS ___H____ "ONPLASTIC VERY LOW CME-550 0-5 RUBBING WITH FINGER FREES NUMEROUS GRAINS FRIABLE W PLASTICITY CASING W/ ADVANCER GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. HAND TOOLS: .D. PLASTICITY 16-25 MEDIUM PORTABLE HOIST TRICONE 2% STEEL TEETH HIGH PLASTICITY 26 OR MORE POST HOLE DIGGER GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMEN TRICONE HAND AUGER * TUNG.-CARR. OTHER GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE CORE BIT SOUNDING ROD INDURATED DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) DIFFICULT TO BREAK WITH HAMMER OTHER VANE SHEAR TEST MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. OTHER EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE. OTHER SAMPLE BREAKS ACROSS GRAINS.

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